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WRITTEN SO YOU CAN UNDERSTAND IT

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Miners Rescued After Nine Days in Pit

Trapped by Flood Waters from an Underground Stream, with Only Crust of Bread as Food

IMPRISONED for nine days far below the surface in the damp workings of a flooded mine in Scotland, their only food a single slice of bread, five miners recently were found alive, and not seriously harmed by their experience. The same waters that trapped them caught 75 others, some of whom, near the surface, escaped alive.

For more than a week in the inky darkness, the men wandered about the chambers untouched by the flood, seeking fresh air and a means of exit. Lights were impossible, for the explosive "black damp" was too heavy, yet the little group steadfastly resolved to perish or live together.

Breaking Through the Last Barrier that Formed a Living Tomb for the Patient Captives Far Underground

On the first day they waded waist deep to a place of safety, where, when pangs of hunger attacked them, they divided the slice of bread. The second day passed, after hours of torment and anxious waiting for sounds that would indicate rescue crews were blasting their way toward the barrier behind which the victims finally had stationed themselves.

Near the end of the first 48 hours, a dull boom broke the tomblike silence. It was quickly followed by another, and still another. To the imprisoned, the shots brought joy and hope, for they heralded the approach of help. Hands were clasped and thanks voiced for their expected deliverance. But their hopes soon dwindled as the long hours dragged on and it became apparent that their would-be rescuers faced more than a possibility of losing the race against time.

Yet not entirely giving way to despair, the five waited expectantly behind their shelter, crawling up and down the workings to keep from becoming cold and cramped, and occasionally making their way to the underground stream to drink. Farewell notes were prepared for loved ones.

But no other eyes ever saw their letters. For, just as the ninth day was drawing to a close, the raspings of picks on the walls of their living crypt were plainly heard. Their vigil was almost ended.

As the last blow was struck by the rescuers, the sandstone wall opened. A hand

was thrust forward from within and a voice was asking for a cigarette. The first one to reach the imprisoned men was a young miner.

"I never saw a cheerier lot of lads than those men at that moment," he said. "The strange thing about it is that, even with good air, they were able to endure such a long time underground. I should fancy men would have been driven insane by such an experience."

Displaying but a few outward signs of the effect of their lengthy imprisonment, the five crawled to the tunnel that led to freedom and the world above, insisting on going to the shaft unaided. Above ground, physicians met them, but only one was found near a state of complete collapse.

FALLEN BRIDGE WEIGHT HALTS TRAFFIC ON CANAL

When a huge concrete balance weight, used to raise and lower a 300-ton "jackknife" bridge over the Lachine Canal, became detached from its supports, the span fell across the stream and for a few days tied up shipping into Montreal, Canada. The block, weighing 1,800,000 pounds, crashed down just as a steamer had passed and the falling bridge narrowly missed the boat. Two large scows were placed under the fallen structure and as the water level in the canal was raised by closing the locks, the span was floated until it could be swung ashore and repaired.

Heavy Concrete Balance Weight of Drawbridge which Crashed Down as the Great Span Was Being Lowered

ARTILLERY AND SIRENS PLAY SOVIET "JAZZ"

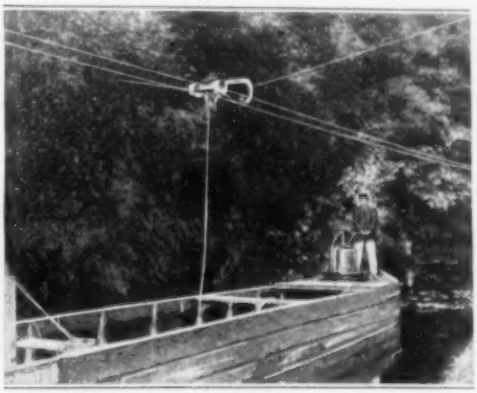
Dispatches from Russia recently told of an attempt by the Soviet government to produce a new bolshevist "jazz" in Moscow. The occasion was the sixth anniversary of the revolution, and the orchestral din that arose was beyond description. Meager reports from the seat of the noise have failed, perhaps because of the stupor in which the music left the populace, to give details of the symphony. Musicians in this country have speculated, however, on the possibilities of some such combination of "instruments" with interesting results. Factory sirens are, of course, not all tuned to the same key, nor are locomotive whistles. It would, therefore, be entirely possible for a city, in which there were a large number of factories and railroad yards, to find a sufficient variety of tones to "carry the tune." Of course, there would be little smoothness to the resultant melody, for not all whistles or sirens are equal in power. In the Russian "orchestra," the rattle of machine guns took the place of snare drums, and the boom of artillery furnished the rhythm of the bass drum. The conductor "led" by means of electrical signals flashed from the top of the Moscow power plant, which is easily seen from all sections of the city.

WAR ON EAGLES THREATENS BIRD'S EXTINCTION

Alaska's campaign against the bald eagle threatens extinction of the species. The territorial authorities some years ago authorized a bounty of 50 cents on each bird destroyed, and it is estimated that fully 18,000 have been killed in the last six years. The eagle lives principally upon salmon, and, as that industry is one of the most important in the territory, some such action was deemed imperative to safeguard the interests of the salmon packers. Great numbers of white men and Indians joined the ranks of the hunters, attracted by the rewards as well as the sport of the chase.

CANAL BOAT LIKE STREET CAR RUNS BY TROLLEY

Experiments in driving canal barges with an electric trolley are reported to have been successful in a recent trial in England. Greater speed is said to have been attained, and the economy of the method may lead to electrification of other canals in that country. Power taken from overhead wires runs a motor-driven propeller in the barge's stern. Only one man is needed to steer, and operating costs are expected to be reduced 50 per cent. In the trial, a fully loaded barge attained a speed of four miles an hour, approximately doubling that of the average horse-drawn boat.



Electric Barge that May Replace Horse-Drawn Boats, Gliding Along an English Canal

HOMES FOR WORKMEN SPRING UP LIKE MUSHROOMS

To provide cheap homes for thousands of working people of New York City, who are facing the serious problem of finding suitable living quarters at low rentals, a development company is building complete frame houses at the rate of two a day on Long Island. Each structure is large enough to accommodate an average family comfortably. In 120 working days, 280 dwellings were practically finished.

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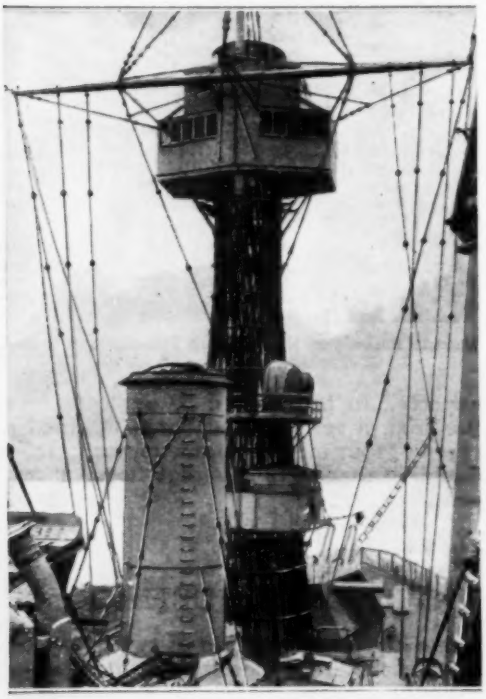
Colony of Frame Dwellings Built on Long Island at Rate of Two a Day to Provide Cheap Living Quarters for Working People of New York City

INSULATORS ON WARSHIP LIKE STRINGS OF BEADS

Every rope and stay of the "Colorado," Uncle Sam's new electrically driven warship, is thoroughly insulated, the knobs



Ropes and Lines on Warship Studded with Insulator Knobs Resembling Strings of Beads

giving it the appearance of being decorated with strings of large beads. Because of the great amount of current generated aboard the vessel and also because the radio is so necessary for its guidance, no electrical leakages can be permitted anywhere aboard. According to navy officials, the craft is one of the best insulated ships afloat.

SUGAR MADE FROM CHEMICALS RIVALS CANE PRODUCT

Synthetic sugar manufactured from chemicals by a carefully guarded secret process is said to have been produced in the laboratory of an Australian scientist. It is so like the natural article that experts, according to reports, have been unable to tell the difference between it and that extracted from cane. The method consists of combining by artificial means, certain elements which are condensed by sunlight in the natural growth of the cane.

FIRES OF QUIET VOLCANO HEAT CITY

Because it lies at the foot of a partly extinct volcano, the streets of Rabaul, capital of Pomerania, are reported to grow so hot at times that citizens are unable to walk upon them even when wearing thick-soled shoes. The temperature in the main thoroughfare several years ago, is said to have risen 37 degrees in two and a half hours. Steam rose through the ground, and the residents, fearing a volcanic eruption, prepared to flee. Scientists say that there is little danger, and that the disturbances, which are accompanied by mild earthquake shocks, are due to the temporary thinning of the earth's crust during cooling and settling.

NOVEL BOOSTER FOR CROPS IN NEBRASKA EXHIBIT

Sheaves of grain and bright-colored ears of corn were fashioned into figures of a farmer, a pig, and a model barn, to emphasize to growers attending a recent county fair in Nebraska, the importance of raising more corn and hogs. The man was shown emerging from the miniature building to lead a campaign for greater agricultural production. The barn was decorated with festoons of large vegeta-

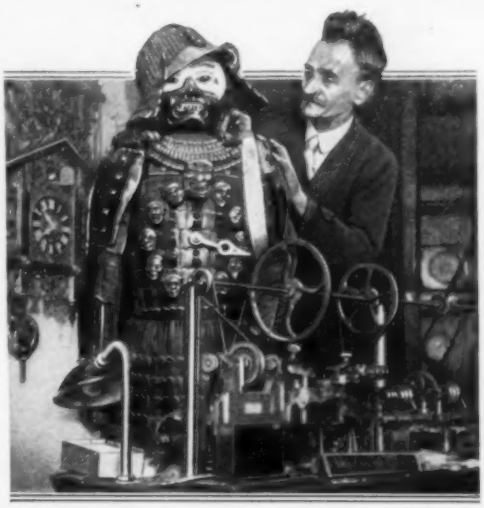
Attractive Exhibit at County Fair in Nebraska Shown in Campaign for Paying Crops

bles, and designs were traced in split ears of corn nailed to the siding on the outer walls. The roof was thatched with stalks.

¶Dynamite was used to remove a huge iron pulley in a western city recently. Although the building was small and 30 sticks of explosive were used, no harm was done to the walls.

CLOCKS IN ODD FIGURES SHOW MAKERS' SKILL

Showing skill possessed by watchmakers long before members of this ancient craft had advantages of modern tools, a collection of old timepieces owned by an eastern jeweler, provides an interesting contrast with similar creations of a machine age. Many clocks were framed in queer human figures. One was cleverly made in a suit of armor that moved the hands around the chest and opened and closed the eyes and mouth, at every hour. After five and a half years of labor, one man completed an odd mechanical clock containing 298 moving figures, carved from oak with a penknife. They depict various historical scenes. Experts say that the watches in this display of mechanics of a past day are marvels of art and workmanship.



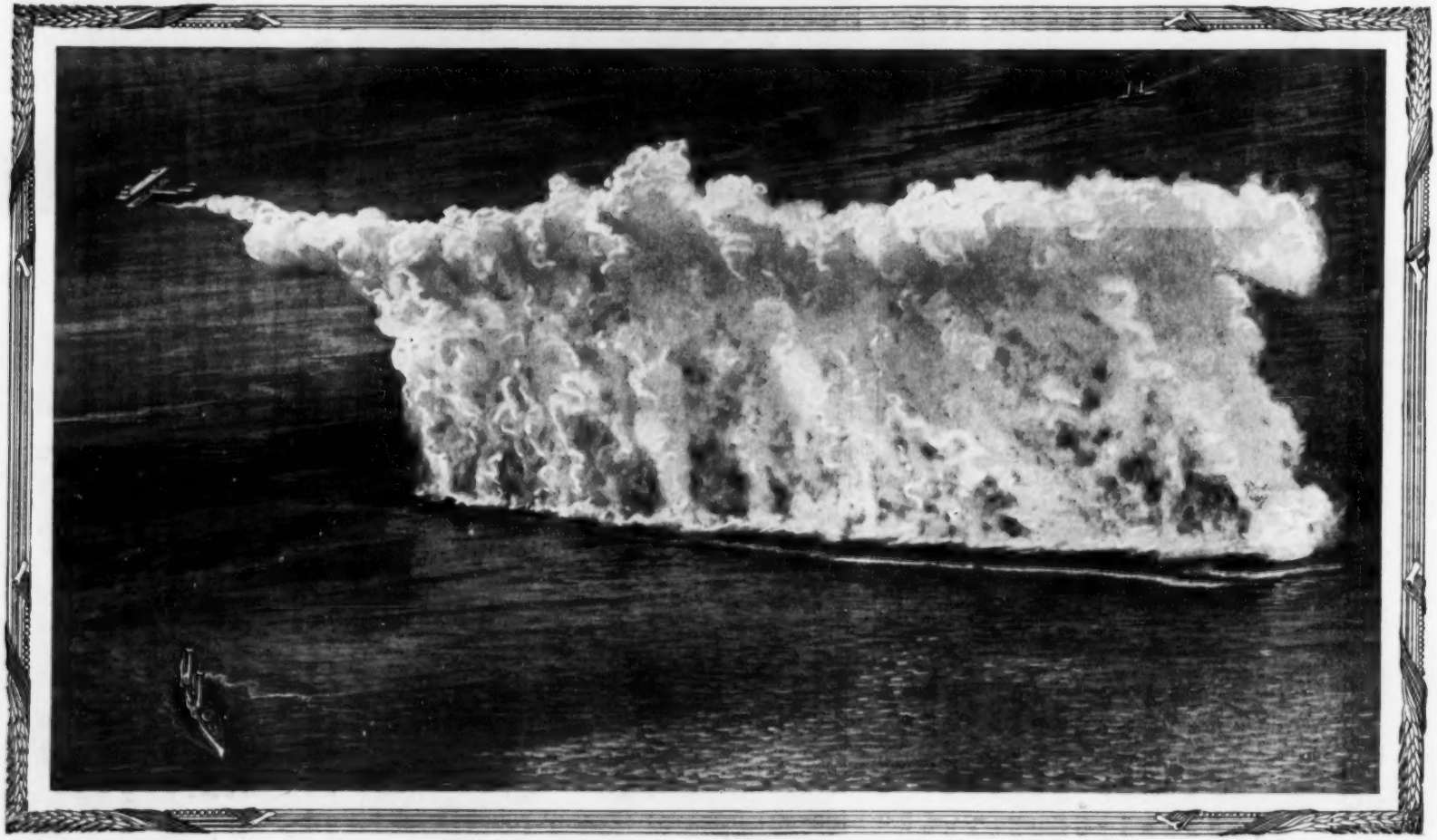
Photos Copyright Keystone View Co., Inc.

Odd Clocks Built in Imitation of Persons and Scenes of Long Ago: Above, Timepiece as an Armored Knight; the Mouth and Eyes Moved as Each Hour Struck

CHECKER FOR LUNCH ROOM SAVES ERROR ON BILLS

Elimination of error and loss is claimed for a novel method of automatic restaurant control recently demonstrated. The system presents the customer with an itemized bill, totaled and correct, and keeps an equally close check at the point where the waiter receives the food. A series of compartments labeled with the items on the menu are controlled by a machine. The name of the item and its price are printed on the ticket when inserted in the slot of any section. A slug is also ejected which the waiter exchanges with the kitchen attendants for the article stamped on the slip. When the order has been filled, the check is placed in the totaling device which adds it and prints the amount.

¶Despite the great cost of radium, it is estimated that 50 per cent of the treatments given with it have been free.



Smoke Curtain Created by Airplane to Hide War Vessels: Note the Thin Stream of Gas Leaving the Nozzle on the Plane; the Mass of Vapor Spreads Downward to the Surface of the Sea, Hanging in a Heavy Screen

AIRPLANE SMOKE CURTAIN HIDES NAVY FORCES

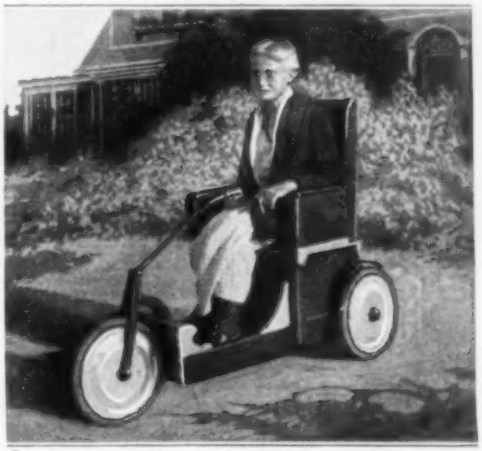
Appearing to grow from the surface of the sea a smoke screen laid down in recent naval trials held by the government, was created by chemicals dropped by an airship. As the plane rushed through the air, the gases were literally sprayed in its wake. Instead of rising, the vaporous mass settled toward the surface of the water, creating a curtain behind which both warships and aircraft could have maneuvered unseen by enemy observers at sea level.

"STONE FISH" OF TROPICS HAS DEADLY STING

Although only 10 inches long, the "stone fish" of the tropics is one of the most deadly denizens of the seas. It has a sharp spine near the end of its tail, and when trodden upon it injects a virulent poison into the wound caused by this spicule. The venom affects its victim in much the same manner as the poison curare: paralysis, convulsions, and sometimes death, or at least the loss of a limb. This fish frequents shallow water on a reef, or is to be found near the sandy border of a beach.

MOTOR CHAIR FOR THE AGED IS EASILY OPERATED

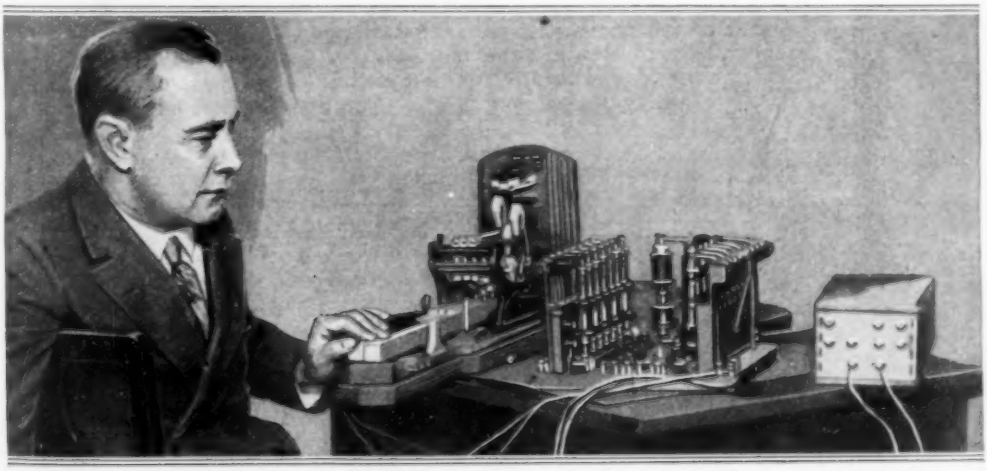
Designed for the convenience of aged persons or invalids, a three-wheeled electric motor chair, with storage batteries, has been constructed by a western inventor. It runs on two speeds, six or twelve miles an hour, and is steered like a tricycle by a handbar attached to the front wheel. The current is controlled by a lever at the left.



Motor-Operated Vehicle that Is Boon for Old People

EXACT TOUCH OF PIANIST PUT ON PLAYER ROLLS

To do away with the need of correcting master music rolls from which player-piano selections are made, a device that registers the exact touch of the pianist has been invented by a noted musician. With this apparatus, it is said, the original is turned out free from errors, thus resulting in a considerable saving. Usually all corrections must be performed by hand, requiring much time and energy.



Costly and Laborious Hand Corrections of Player-Piano Rolls Eliminated by Invention of Famous Musician, which Automatically Performs the Work

Hidden Stars Make Glitter for Opera's Stage

By J. JOSEPH SOLOMON

OF the thousands of dollars annually spent in the production of grand opera, almost one-fifth is said to go into the scenery, costumes, and other properties that depict the colorful backgrounds of the plays.

In the designing of the massive drops and sets used by one of the largest opera companies, 28 miniature scenes, models of those to appear in the portrayal of the repertoire, were painted by a skilled artist. Tiny figures in imitation of the players were posed about so that no detail should be overlooked when the final "sets" were completed.

Even the miniature scenes for such operas as "Carmen" and "Madama Butterfly" are so carefully made that they suggest the spirit of the countries in which their stories are laid. In the street scenes, carts, animals, and figures of people are created with such artistry that, though small, they rival reality itself. Color combinations are carefully worked out. The position of the houses, gardens and walls, and the effect of light on the various objects, are all studied in order to mimic as closely as possible the nature of the locality and the general styles that marked it during the period in which the action is supposed to have taken place.

Armed with these patterns, the craftsmen behind the scenes begin to create from mountains of materials, the massive properties. Great curtains or drops are built from a strong fabric. Painters, masters of

the brush whose business is entirely confined to the designing of stage scenery, work up forested backgrounds, sunsets and dawns that vie with those made by nature.

In the meanwhile, from drawings furnished him, the director of properties gathers the articles needed in interiors. If a church scene, say of the twelfth century, is to be produced, there are altars, candlesticks, an organ, seats and like objects that must appear as really belonging to the time. First, museums and art galleries are consulted for records, picture or copies of such things. Photographs are then furnished the carpenters and cabinet makers to guide them in their task of artful imitation. Ordinary woods are used in the furniture, and surfaces are carefully stained to resemble the originals. Where a fireplace must be made, a skeleton of framewrok is put up, and over this is tacked a covering of burlap or other coarse cloth drawn tightly about it. The matter of the outside is one which the type of the article itself determines. An ordinary plaster, marked in squares, serves to imitate dressed stone. If the affair is to be a rough finish, ground cork mixed with glue is smeared over the cloth, and a finishing coat of proper color is applied in paint. The electrician then wires it for the fire which glows from colored incandescent lamps.

Whether the set is a peasant's home in Italy, the dwelling of a struggling villager of Russia or the castle of an acient king, no piece of property, however small, is overlooked. Everything from a broom to a throne room is accurately checked up for style. Should the inside of a hovel be shown, great care is taken that none of its furnishings belongs in a mansion. A village blacksmith of the fourteenth century could not be properly portrayed by an actor wearing boots that might have been worn by a cavalier. Neither would the cavalier be correctly dressed in a pikeman's helmet. Even the letters, papers, and documents which are handled during plays are true copies of some that once existed. Some singers refuse to pretend to read from blank papers, but must have printed copies of the original documents costing big sums of money to obtain.

To avoid any errors in this policy of realism, each piece of a set is labeled and kept in its proper case or trunk which also bears a similar mark to guide the property men. Acres of space would be filled by the cases and hampers which contain complete equipment for more than 25 operas. A system of records makes it possible to locate and unpack any desired material in a few moments.

The fact that the various articles needed to make up a scene can hardly ever be obtained from dealers in antiques, necessitates the establishment of shops and studios wherein these things can be worked up by a large staff of specialists. To have them made by outsiders would send the cost to prohibitive heights. For instance, in one scene of an opera the principal character must simulate insanity. Waiting for the execution of a sentence of death which has been pronounced upon him, he counts the hours as he watches the clock. Madness attacks his mind and to his delirious eye the hands of the clock seem to whirl around the dial. A bronze eagle which is perched on top of the timepiece as an ornament appears to him to flap its wings and try to escape. In permitting the audience to see with the madman's eyes, a clock was made with a mechanical arrangement that would produce this effect. At a given signal, an attendant back stage works it by means of a rope and a small pulley.

In "Samson and Delila," the properties call for immense columns that, in accordance with the story of the opera, are overthrown by the captive giant. Although these are made of substantial materials, hardly a performance of the play takes place without some injury to them, necessitating frequent repairs. New paint must be put on and perhaps a few patches of plaster. This mending is generally done on the stage between performances.

The carpenter shop is a constant scene of activity. Furniture, of the Louis XV

Opera as an Industry

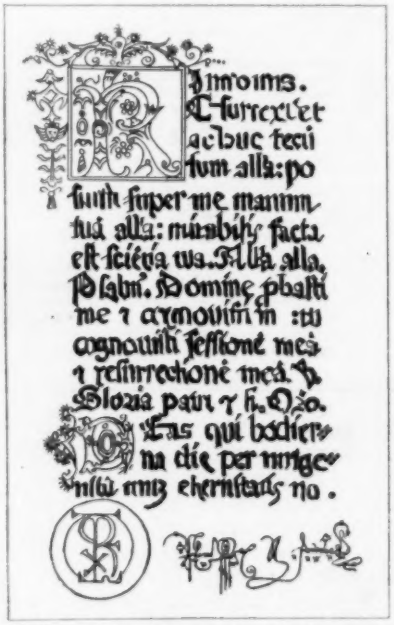
SEVERAL millions of dollars are invested in properties and other stage equipment by one of the big opera companies. Over five thousand huge scenic curtains measuring sixty by forty feet are tucked away much like books in a library. Each one is labeled and numbered with its position in a set. It is estimated that several hundred pounds of paint are necessary properly to cover one of these drops.

The workrooms of the property men are constantly busy throughout the year replacing and repairing scenery and costumes and making new material.

The costumes alone would require two railroad cars to transport them. The home stage of this company is entirely mechanically operated. It is built in five sections which can be raised or lowered from ten to twenty feet by steam rams. Not more than a few minutes is necessary to complete such a change in its level.

pattern, is piled astride a chariot of the Roman era. Near by stands a huge dragon-footed caldron of the type in which evil brews were once believed to have been made by witches. At first it appears to be of copper or bronze. However, closer inspection discloses that not only is it an imitation of the metal, but its weight is less than a hundredth part of such an article in the genuine metal.

For "Antony and Cleopatra,' there is a great barge in which the Queen of Egypt is portrayed floating on the River Nile. Since it must be of sufficient size and strength to accommodate several persons on its decks, the construction is such that there can be no likelihood of its collapsing or weakening with use. Furthermore, in traveling about the country, when shipping space is an important consideration, the barge has to be taken down in sections and folded up in large crates. After the framework was made, it was covered with canvas and painted and gilded with a perfection that easily deceives the eye.



Copies of Old Documents Aid Actors in Their Roles

Swords, spears, armor, and other equipment befitting well-caparisoned soldiery is under the care of the stage armorer, whose duty it is to see that these are kept burnished and in repair. For his work he has buffing wheels and a large room fitted with benches and tanks where the metalware can be dressed and lacquered to a mirrorlike finish. The more brilliancy displayed, the finer will be the spectacle. The effect of powerful lights on the glittering arms of the retainers in the military roles adds a striking tone to the dramatic moments that hold audiences enthralled.

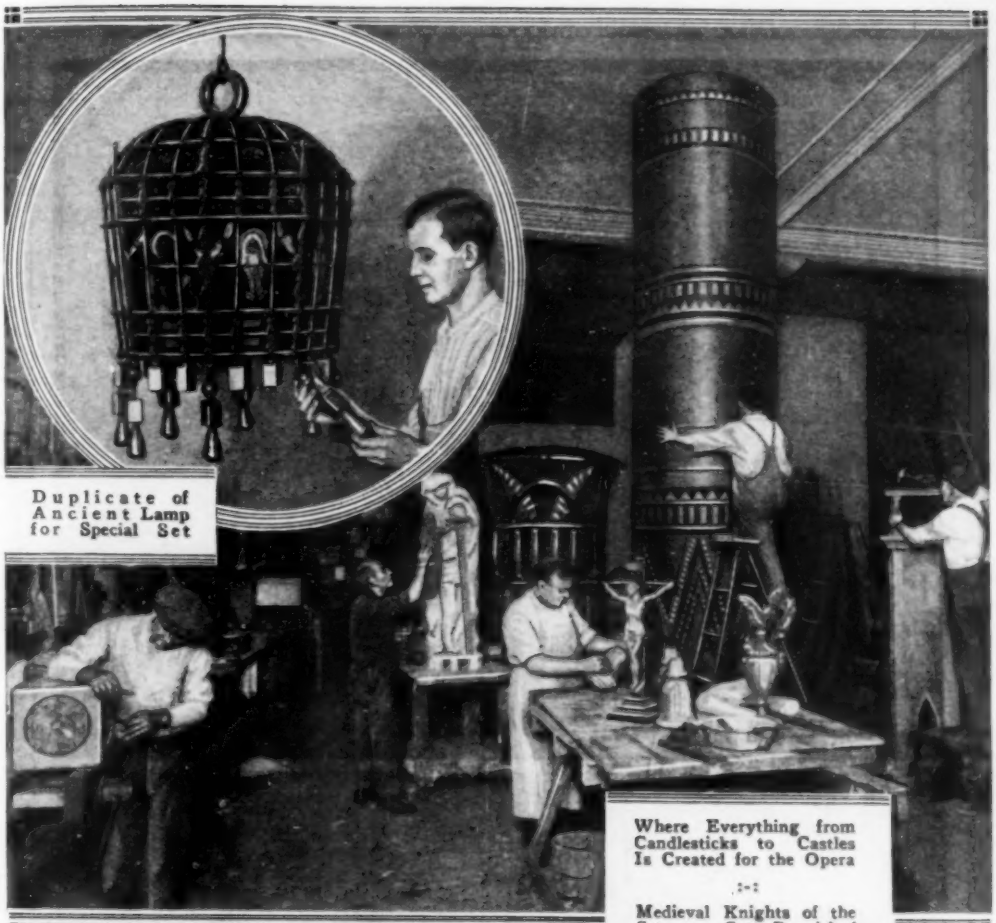
Although unseen by those in front of the footlights, the stage mechanic is as much concerned with the success of the performances as the most zealous of the principal actors. Not a situation is permitted to pass by him without he has first studied his part, played amidst a maze of mysterious canvas slides and walls and mountainous stacks of properties.

Lighting effects are vital. Any degree of color from the soft glow of an Italian sunset to the most intense rays of desert skies, can be cast on the stage from hidden sources. There may be a forest scene where the sunlight filters through the tree tops to be reflected by a sparkling waterfall that cascades over moss-covered rocks. Only after a careful inspection by a master of light effects are such arrangements attempted. He must be familiar with the slightest details of the picture. Shadows must fall true to nature. The water should not be so noisy as to encroach on the singers' melodies.

The ingenious minds of the stage crafters are constantly called upon to solve difficulties bearing on important situations of the play. Signals must be flashed to the orchestra and the workers on the big drops must be carefully trained for their parts.

A sword-maker working at his forge and anvil is given a setting of such realistic value that there will be no mistaken action that might mar the piece. One star spent several hours every day for weeks before his performances began in rehearsing his role of a blacksmith. Tucked away in a corner of a dark wareroom, filled with a mass of miscellaneous "props," he worked over an anvil of burlap and plaster so much like the real article that it could almost be expected to withstand the rough treatment given those of which it was a counterpart. Behind the "smith" stood a great bellows which he pumped by means of a rope hanging near his shoulder. With each motion of his arm the fire in the forge seemed to flash up, dying down again as the bellows was released. As actual flames could not be used, electric wiring and colored lamps were substituted.

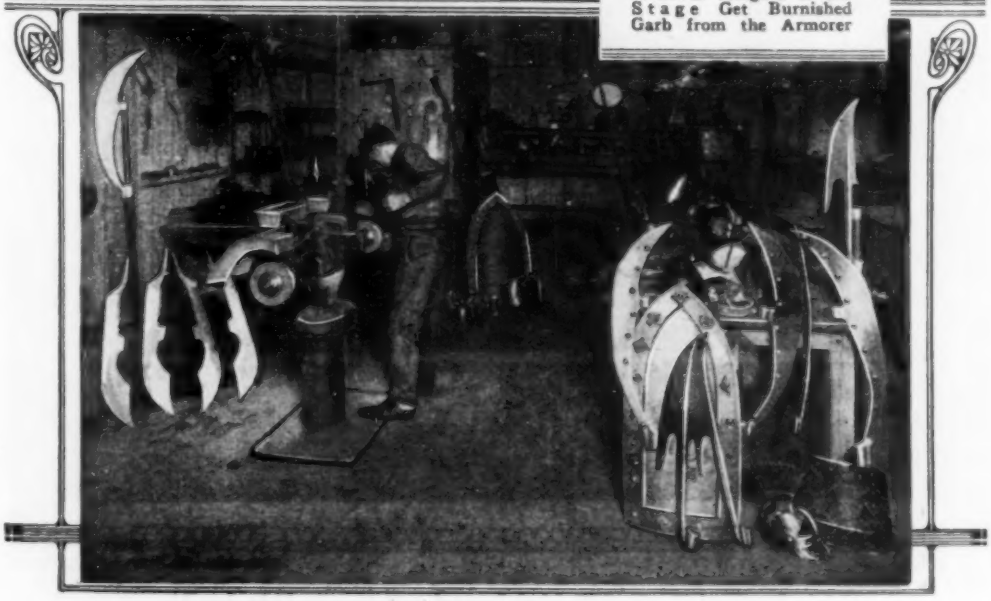
The anvil next received the attention of the singer. As it rang to the sound of his hammer, its tones seemed to harmonize with his voice. At a point in his recital the player raised the steel in his hand and struck the anvil apparently with such

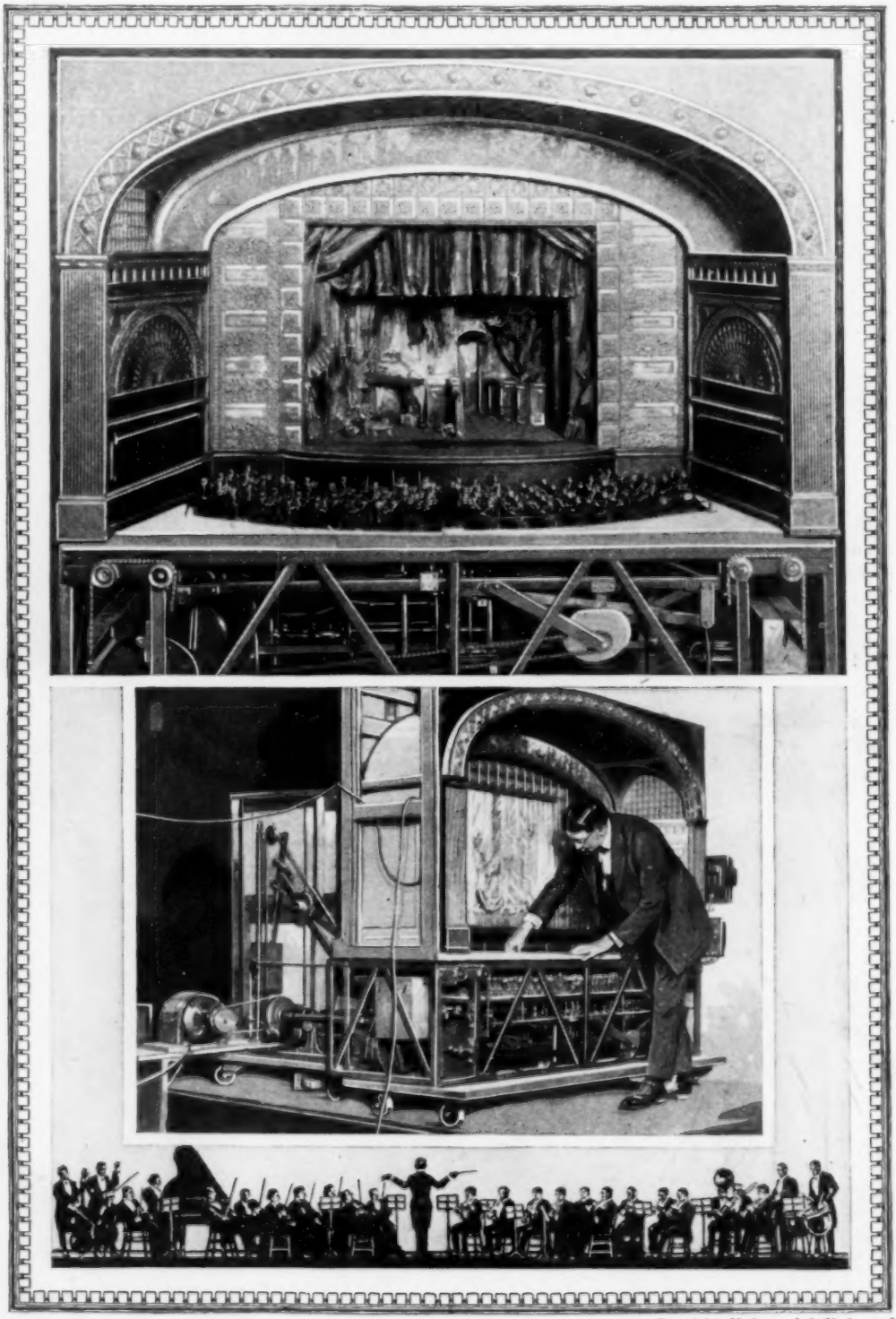


Duplicate of Ancient Lamp for Special Set

Where Everything from Candlesticks to Castles Is Created for the Opera

Medieval Knights of the Stage Get Burnished Garb from the Armorer





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Above: Mechanical Miniature of Orchestra and Opera Stage that Automatically Changes Scenes. Below: Curtain Closed and Figures of Musicians Lowered while New Set Moves into Place

force that it split in two. Mechanics had again performed the task. Under an iron plate on the anvil a trigger was placed. As the player struck that spot it released the sections of the anvil, allowing them to fall apart.

When traveling about the country, a large opera company has need for almost as much equipment as is used in the home theater. While there is seldom a stand of less than two days, the property staff must be able to set up a complete stage in a few hours. The electrical effects carried amount to several tons. Wire reels, huge floodlights, incandescent bulbs of every description, and even small power plants, all neatly arranged in durable crates that are built to withstand the roughest handling, are needed.

On entering one large hall where several performances were to be given, it was learned that there was no stage. One had to be built. As preparations were made to erect the platform, the workmen were informed by the owners that no nails could be driven into the floor. Only four hours away the performance was scheduled to begin. Several hundred bags of sand were hastily brought in, and over and against these, heavy timbers were placed to which scenery could be attached.

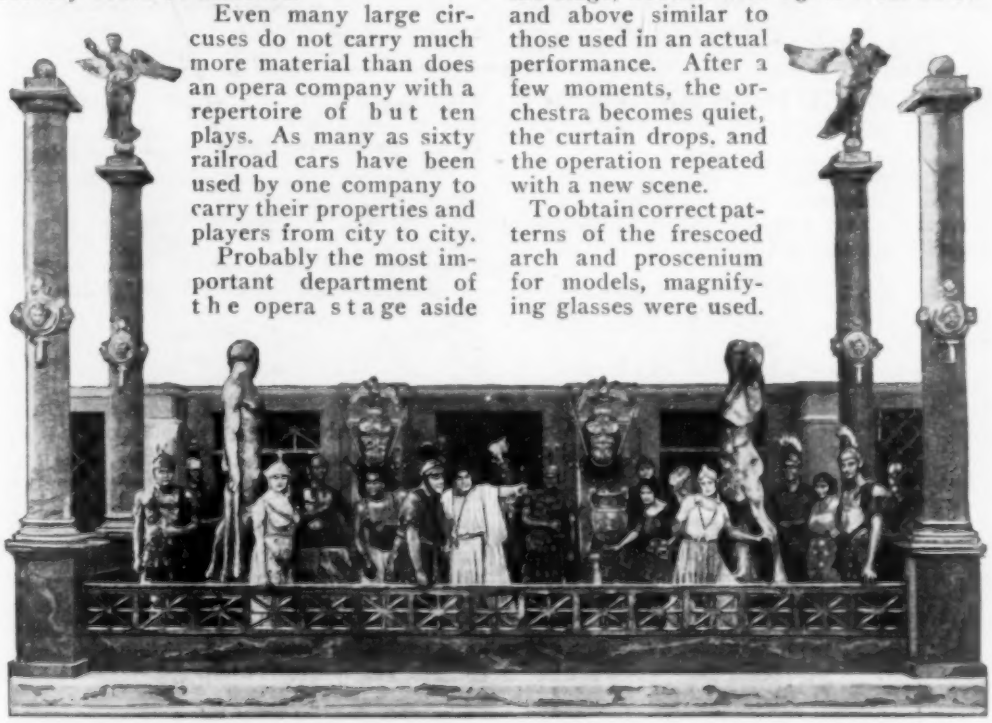
Even many large circuses do not carry much more material than does an opera company with a repertoire of but ten plays. As many as sixty railroad cars have been used by one company to carry their properties and players from city to city.

Probably the most important department of the opera stage aside from the actors, is the costumery. Under the direction of a master of the wardrobe, hundreds of gowns, uniforms, hats and helmets are cataloged for characters ranging from Roman slaves to pompous kings and gorgeously garbed nobles of later times. Huge chests of bright hued boots and shoes and hundreds of pairs of fancy slippers await the needs of the cast or the chorus master.

As an added aid to the preliminary planning of the opera builders, members of the mechanical staff of a Chicago company built an automatic working model of its stage and orchestra. Operated by an electric motor, it changes scenes every few minutes to produce the actual effect of the spectacles as seen by the audience. Two years of careful designing and many thousands of dollars were spent in its construction. In the orchestra are eighty-one tiny bronze figures representing the various musicians. Each is worked individually by delicate mechanisms inside of the forms.

At a given signal from the "director" the players manipulate the imitation instruments with motions startlingly like those of living musicians. A satin curtain is drawn back and the setting appears on the stage, flooded with lights from below and above similar to those used in an actual performance. After a few moments, the orchestra becomes quiet, the curtain drops, and the operation repeated with a new scene.

To obtain correct patterns of the frescoed arch and proscenium for models, magnifying glasses were used.



Towering Columns and Massive Walls are Built to Harmonize with the Period Costumes that Glitter in Regal Splendor Under the Dazzling Lights of the Opera Stage

SPEED OF MACHINE AND MAN CAUGHT BY CAMERA

Speed Camera Registers a Difficult Goal and Catches Auto Racer Rounding Turn at Terrific Pace

Thrills that electrified spectators at an automobile race and soccer game are reproduced by lucky "snaps" of quick-action cameras. The player in one picture has just made a goal by bunting the ball through the posts with his head, a feat seldom witnessed, but the photographer caught the play. And as the mechanician of a speeding car in a recent road race in Germany was looking out for tire trouble, the other picture was snapped as the car rounded a curve at terrific speed. Despite the rapidity of the camera shutter, the quickness of movement of both subjects caused distortion.

RECEIVER ON PHONOGRAPH AIDS IN SELECTING RECORDS

For demonstrating phonograph records, a talking machine has been invented with a receiver that prevents sounds reaching other than the listener's ear. Thus, it does away with the need of individual booths and aids in saving floor space in a store. It has the appearance of an ordinary instrument and can be attached to a counter or table.

Talking Machine for Demonstrating Phonograph Records Can Be Heard Only by the Listener

QUININE-BEARING BARK FOUND ON TREES IN NEW GUINEA

Quinine in great quantities has been found in the bark of certain trees native to New Guinea. Nearly ten per cent more quinine can be extracted from this bark than from other plants now known, it is said. An American scientist, traveling through that country, discovered the value of the bark, and with others has planted 100,000 of the trees for producing the drug. Until 1867, manufacturers depended almost entirely upon South America for their supply of the material which is drawn from cinchona bark. Small quantities have also been procured from trees growing in Java, India, Ceylon, and Jamaica.

¶By a new attachment it is possible to convert a small tractor into a ditch digger.

RED LIGHTS LURE INSECTS TO DEADLY FUMES

Winged night insects in tropical regions are sometimes lured by red lights into poison fumes which kill them. An ordinary electric bulb, or the outer glass of an oil lamp, is painted with a red substance and placed near a vessel containing a strong solution of acid. When the pests swarm toward the bright rays the vapor from the liquid destroys them. Persons are protected against contact with the acid by placing it in a bottle fitted with a funnel, into which the flying bugs fall when overcome.

HINGED WINDOW IN AUTO DOOR AID FOR ARM SIGNALS

For motorists who drive closed cars, added safety while making traffic signals is provided by a hinged lower section of the glass door at the driver's side. The device, perfected by a western inventor, allows the lower part of the door to swing outward horizontally when pushed by the driver's arm. It is high enough so that signals can be made freely in the space when the section lies flat on its outer support, a rod bracket fastened to the car. The section is closed by a lever or a weighted pull-cord controlled from the interior of the car. It may also be opened by a lever. When closed, the swinging

Hinged Window Section for Automobiles that Permits Hand Signaling on Outside of Closed Car

section is made to fit to the upper part of the door snugly and a brace keeps it from falling through on the seat.

Cherokee Indians gave their children a concoction made from burs to strengthen their memory, under the impression that as a bur will stick to anything, a man lined with burs will be able to hold all useful information.

ODD ANCIENT VOLUMES SHOW PROGRESS IN BOOKMAKING

Since the invention of printing, early in the fifteenth century, the progress of bookmaking has kept pace with that of printing.

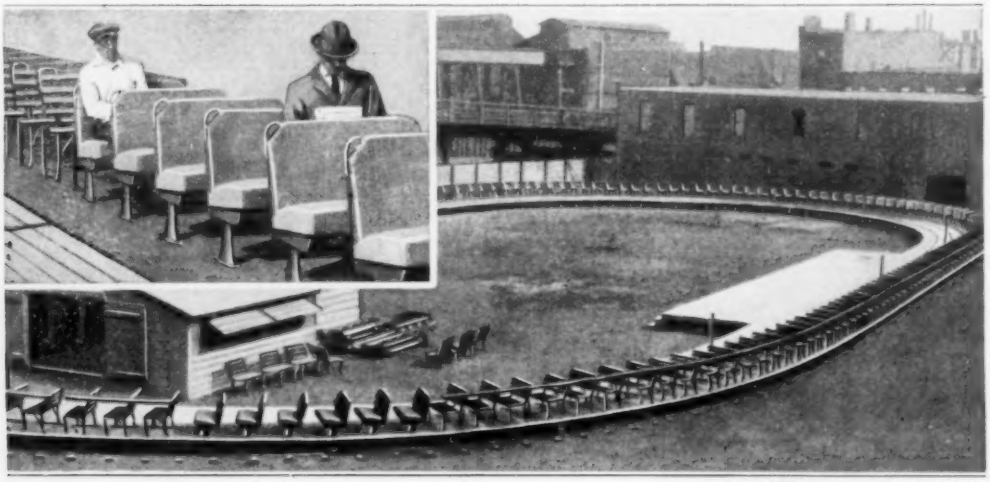
Book that Is as Tall as a Man and Locks by Three Hasps on the Cover

Soon after the first books were run off the old hand presses, many queer volumes have appeared. Among them is a very large one, as tall as a man, which is now the property of a university in Holland. The institution also owns another that is small enough to be concealed in the hand, which was penned instead of printed.

STATUE SEALED IN BOTTLE MADE TO "BLEED"

One of the favorite tricks of magicians in India is to draw "blood" from a clay statue some time after it has been placed inside a glass bottle, sealed so that it cannot be tampered with. The flask is put in a temple and the people are told that in about ten days a worker of magic will make red drops issue from the figure. The trick is done by use of a germ unknown to the observers. When a culture of this microbe remains in a warm spot for about ten days, it produces a liquid that resembles blood so closely that the difference can hardly be determined.

MOVING "SIDEWALK" OF SEATS FOR NEW YORKERS



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Moving "Sidewalk" of Seats Suggested as Means for Relieving Crowded Subways and to Accomplish Transfers of Passengers over Long Distances Between Platforms: Above, Close View of Benches

Fitted with seats, a moving "sidewalk" similar to that demonstrated at the Chicago World's Fair, was recently offered the city of New York as a means of taking the place of subway trains that now connect the east and west-side lines. Three parallel platforms, running at 3, 6, and 9 miles an hour, respectively, would be arranged in an endless chain if the suggestion of the inventors was followed. A continuous walk inside the low-speed carrier would permit passengers to board or leave at any designated point along the route. At present, persons wishing to change from one to the other of the subway lines, must at certain stations walk several blocks. The sidewalk is also offered to do away with this inconvenience.

PAPER BATH SLIPPERS TO KEEP FEET CLEAN WHILE DRESSING

Sanitary bath sandals are being made of tough crepe paper so they can be thrown away when once worn. Slipping them on after a tub or a shower, the bather can stand on an uncarpeted floor in comfort and dress without soiling his feet. Besides insuring cleanliness, they are inexpensive, for their cost is said to be less than that of laundering a towel, which not infrequently is used to wipe away dirt picked up while walking about barefooted. Conveniently placed in a rack on the bathroom wall, a fresh pair can always be available.

Bath Slippers Made of Heavy Paper to Be Worn Once and then Discarded

MOUSE SHORT-CIRCUITS POWER SYSTEM, WRECKS PLANT

When a small mouse crept into an air gap between two 6,000-volt cables at the electrical generating plant of a European city recently, it caused a disruption of the entire system served from the station. The door of the switch chamber at the power house was blown out, the main cables and much machinery were wrecked, and the building was filled with smoke from burning insulation, set afire by sparks caused by the short circuit.

¶China's first attempt to spin cocoons according to the machine system was made in 1873. There are now 207 steam spinning mills in that country.

SKYSCRAPER IS BEST REFUGE IN STORM, SAYS EXPERT

Big buildings act as lightning shields to protect the people inside of them during storms, according to an expert who spoke recently before the International Fire Prevention Congress. The safest place during an electrical disturbance, it was declared, is a large metal, or metal-frame building. After that comes a small structure equipped with lightning rods, and, last, outdoors, in the open. People were urged to avoid metal conductors, such as telephone and electric-light systems connected to the outside, screened doors and windows, down spouts, stoves, and fireplaces. Comparative safety may be found, if outdoors, in thick timbers and depressions, such as deep valleys and canyons.

OUTRIGGER PONTOONS ON BOAT TO PREVENT ROCKING

So his small yacht would ride smoothly in rough seas, a western man fitted it with pontoons, one on each side, similar to Hawaiian outrigger canoes. The craft glides through the water without tipping or rocking, and there is less danger of it being overturned by strong winds or high waves, as these air-tight appliances tend to keep it on an even keel. For those not accustomed to the motion of a sailing boat, the attachment lessens the possibilities of seasickness and adds to the enjoyment of the sport.

Pleasure Boat Fitted with Pontoons to Keep It from Rocking in Heavy Seas

SCREEN MADE OF MELTED COINS RELIC OF FORGOTTEN ART

Skillfully carved in beautiful designs and gilded with liquid gold, made by dissolving coins in sea shells, a church screen in a western museum recalls the splendor of a long-forgotten art. Though, with modern machinery, many new ways of handling minerals have been perfected, no one has discovered how Spanish artisans in early days wrought exquisite patterns from melted coins. It is said that these were reduced to a fluid state and applied before the mass could cool.

Rare Screen Gilded with Melted Gold Coins in Lost Art of Early Spanish Craftsmen

EXECUTED FOR BURNING COAL UNDER BAN OF KING

About 600 years ago men were beheaded in England for burning coal. A king's proclamation forbade its use for fuel, because the gases were said to be detrimental to health and vegetation. Mysteries of the smoke and odor were not solved until the middle of the 17th century. Today research chemists obtain from it gas, dyes, poisons, explosives, substitutes for sugar, perfumes, tanning materials, flavoring extracts, photographic developers, antiseptics, and medicines.

¶To warp the liner "Majestic" into its pier recently, 18 tugs were required.

Fighting Seas of Fire in Timber Lands

Watchful Knights of the Forests Who Save Lives and Property from Conflagrations that Destroy Miles of Wooded Areas

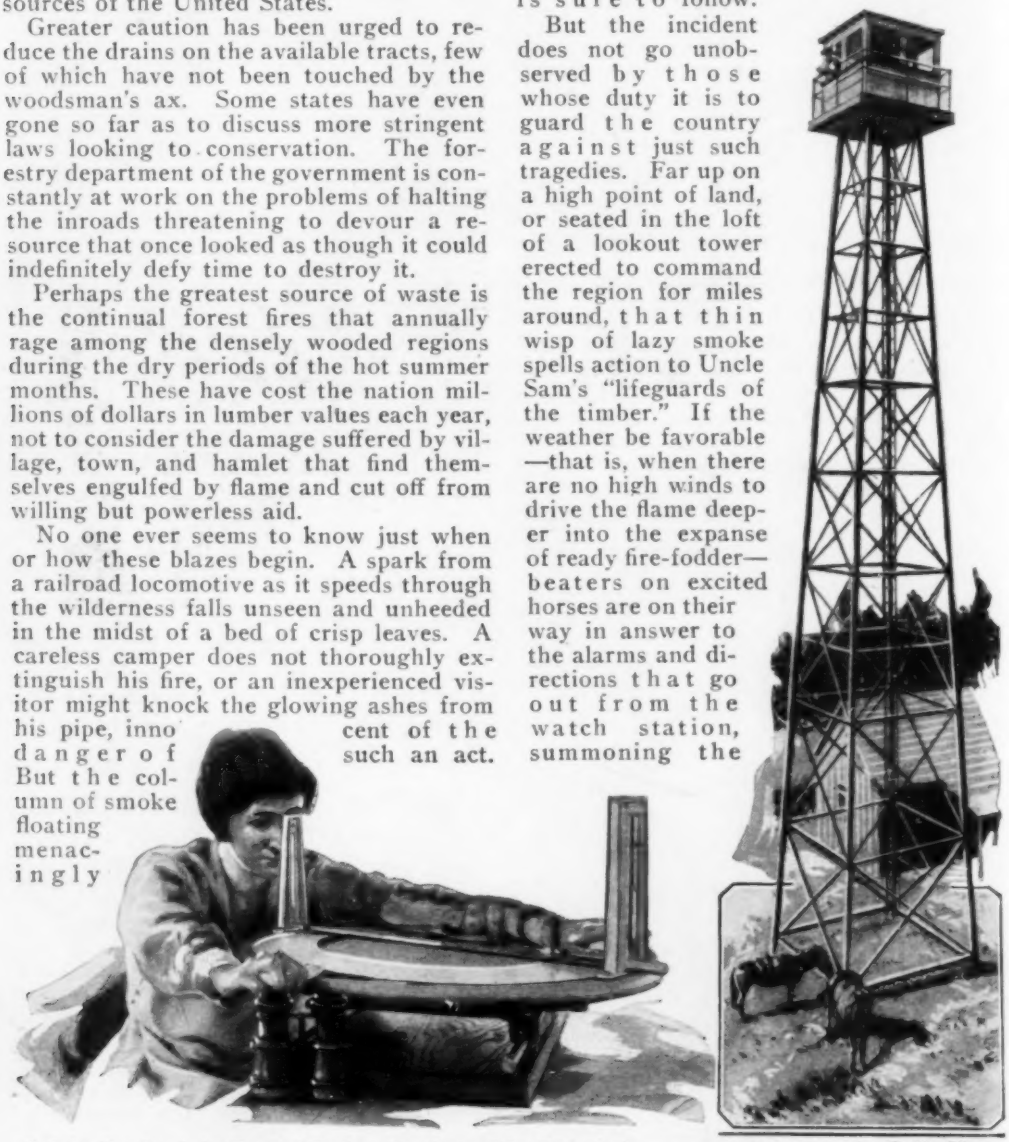
WITH the shipment overseas of millions of feet of raw and dressed lumber to supply Japan with material to replace the thousands of homes destroyed by the recent disaster, attention has again been turned to the dwindling timber resources of the United States.

Greater caution has been urged to reduce the drains on the available tracts, few of which have not been touched by the woodsman's ax. Some states have even gone so far as to discuss more stringent laws looking to conservation. The forestry department of the government is constantly at work on the problems of halting the inroads threatening to devour a resource that once looked as though it could indefinitely defy time to destroy it.

Perhaps the greatest source of waste is the continual forest fires that annually rage among the densely wooded regions during the dry periods of the hot summer months. These have cost the nation millions of dollars in lumber values each year, not to consider the damage suffered by village, town, and hamlet that find themselves engulfed by flame and cut off from willing but powerless aid.

No one ever seems to know just when or how these blazes begin. A spark from a railroad locomotive as it speeds through the wilderness falls unseen and unheeded in the midst of a bed of crisp leaves. A careless camper does not thoroughly extinguish his fire, or an inexperienced visitor might knock the glowing ashes from his pipe, innocent of the danger of such an act. But the column of smoke floating menacingly above the forest, a couple of hours later, serves warning to the isolated timber dweller a few miles away that he had better shift himself and his belongings from the path of any wind that might rise to add its draft to the sweep of flame that is sure to follow.

But the incident does not go unobserved by those whose duty it is to guard the country against just such tragedies. Far up on a high point of land, or seated in the loft of a lookout tower erected to command the region for miles around, that thin wisp of lazy smoke spells action to Uncle Sam's "lifeguards of the timber." If the weather be favorable—that is, when there are no high winds to drive the flame deeper into the expanse of ready fire-fodder—beaters on excited horses are on their way in answer to the alarms and directions that go out from the watch station, summoning the

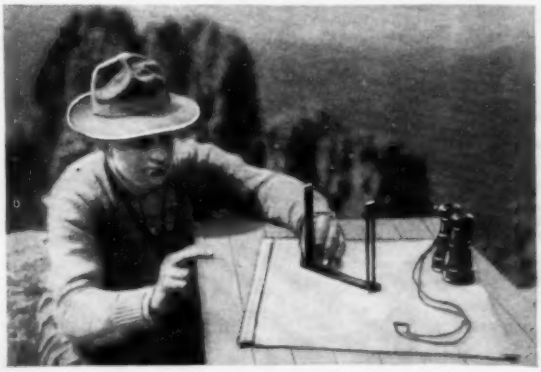


Infinite Details of the Forested Regions Are Learned by Trained Operators and Marked on the Guide Maps. Right, Observer Station Where Fire-Fighters Watch for Signs of Danger

Where Water and Hose Would Be of no Value, Forest Firemen Resort to the Soil and Shovel to Smother the Spreading Flames of Tinder-Fed Conflagrations

valiant fighters of the forestry division to the scene.

Armed with picks, shovels, and brimming water buckets, and equipped to combat the blanket of choking smoke which the enemy throws off in seeking to defeat them, the crews of the forestry fire department enter upon a task that may last for days and weeks before the conflagration is finally checked and extinguished.



Engineer of the Forestry Service Gathering First-Hand Data of Timbered Lands for Use of Field Crews

There is no day and night in the life of these heroes. Sundown means merely an incident in their tireless struggles against an often almost inaccessible monster. In the darkness of night they have the glow of the flames to guide them to their battlegrounds. Daylight leads them to it by the inevitable smoke signal. Where either of these is thickest, there is the goal they seek.

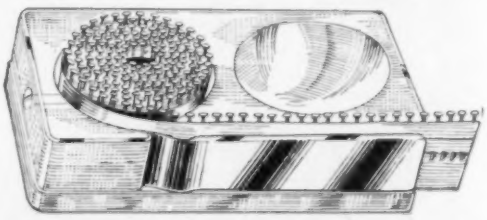
In the hands of each district crew are maps of the territory to which the fighters are assigned. On it can be found in a twinkling the necessary information to guide the men in their work. Each particular stand of trees, whether they be spruce, hemlock, mixed, or whatnot, is identified on the drawing. All streams—for they are of utmost importance on occasions—are shown. Then, when the alarm is given by telephone, telegraph, or flag signal, and these lifeguards of the forest are familiar with the various means of sign language, the scattered forces need but to refer to their maps for detailed directions as to the location and kind of a tract they are to reach.

Nor is the airplane overlooked in the effort of the foresters to reduce fire losses to the lowest possible figure. Patrols are regularly sent out to reconnoiter from a position of three to five thousand feet above the woods. In case of trouble, these aerial scouts report the location of the fire, its extent, and in other ways keep the ground men advised of any peculiarities that attend the spread of the flames. Often the blaze will sweep for hours slowly toward some important point that may mean serious loss if it should be reached, and then, with a sudden and uncanny twist, turn in another direction as though guided by a knowing hand.

During the dry seasons the forests of the North and West are always in danger of fires, which sometimes burn for weeks and die out only when they have reached their limits and nothing lies in their paths to feed them. And as often, just as they threaten defeat to the loyal and tenacious energies of the firemen, the clouds will send the much-needed aid to quench the raging flames—rain. This ally of the skies is never more welcome, never more prayerfully expected, than it is when the forest green becomes a thing of terror to those who have learned at such times to hate the big woods for the dangers they might hold.

PINS IN PAPER-ROLL HOLDER TORN OFF AS NEEDED

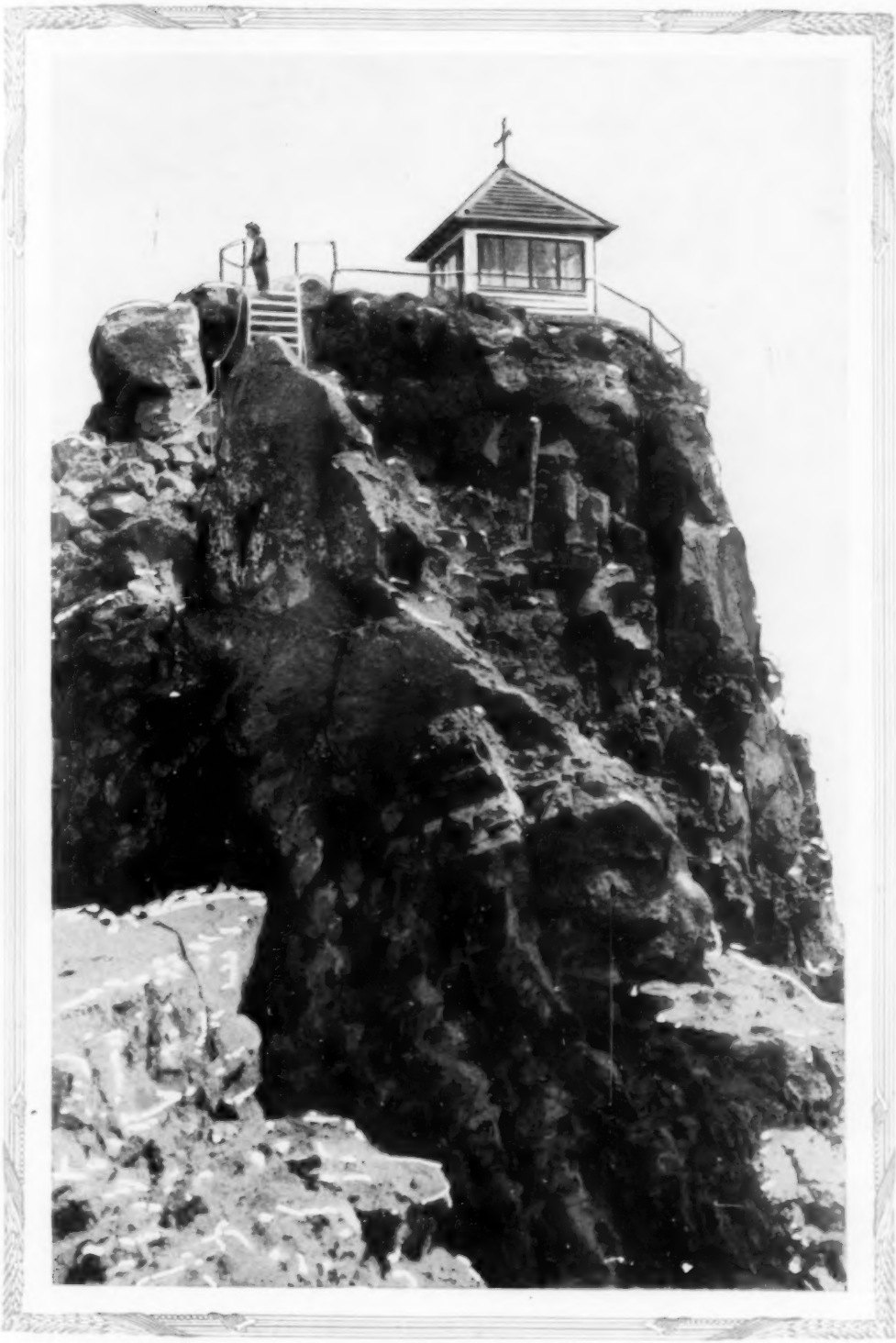
So that pins may be instantly available, a glass holder is being made for desks from which they are unwound as needed from



Holder that Keeps Pins in a Paper Roll from which They Can Be Easily Picked

a paper roll. When one is wanted, it can be easily picked out of the container without risk of scratching or pricking the fingers against points of others. As the pins are used, the paper is pulled out and thrown away. A separate compartment is provided for clips.

¶Wild animals of India's jungles killed 3,263 persons in 1922.



Even Thunder Storms Do not Escape the Untiring Vigil Kept Night and Day by the Loyal "Lifeguards of the Mountain Ranges" in Lofty Towers that Crown the Highest Peaks

MAGNETS HOLD DIVING BELL TO SIDES OF SHIP

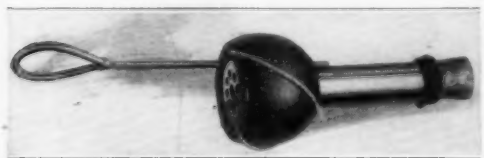
Heavy magnets firmly grip a new type of diving bell to the side or bottom of a ship, while as many as four men, breathing

Diving Bell that Magnets Hold to Ship while Several Men Work Many Hours under Sea

air in tanks attached to the outside, can stay down for hours at a time. Several high-powered electric lamps on the sides of the strange-looking craft light the scene. A large drill is operated from the inside. So complete is its equipment that it is known as an undersea limousine and is of special use in repairing vessel hulls.

MUSICAL PLUG FOR HORNS CREATES "JAZZ" TONES

Distorting the tones of cornets and trombones to get "jazz" music may be accomplished by a recently invented device, that fits the bell of the instrument like a plug. Moving it back and forth produces wavering, mute sounds. It can also be fixed so that the pitch will not change. A perforated disk over a vibrator at the



Musical Plug for Bell of Horn that Gives Peculiar "Jazz" Effect to Instrument's Tones

end of a metal tube, blends and spreads the notes to a peculiar blare.

READY-CUT MODEL HOUSES SENT TO QUAKE VICTIMS

Modern ideas in home building will invade the Far East as a result of the shipment of American ready-cut houses to help replace the million or more homes leveled by the recent earthquake in Japan. The first model sent across the Pacific was a five-room California bungalow, weighing 30,000 pounds. Each piece of material was prepared in the mill, ready for actual nailing in place. Also, such items as glass, hardware, electrical and plumbing fixtures were shipped with the lumber.

HORSE TAKES TEN-FOOT FALL, RESCUED BY DERRICK

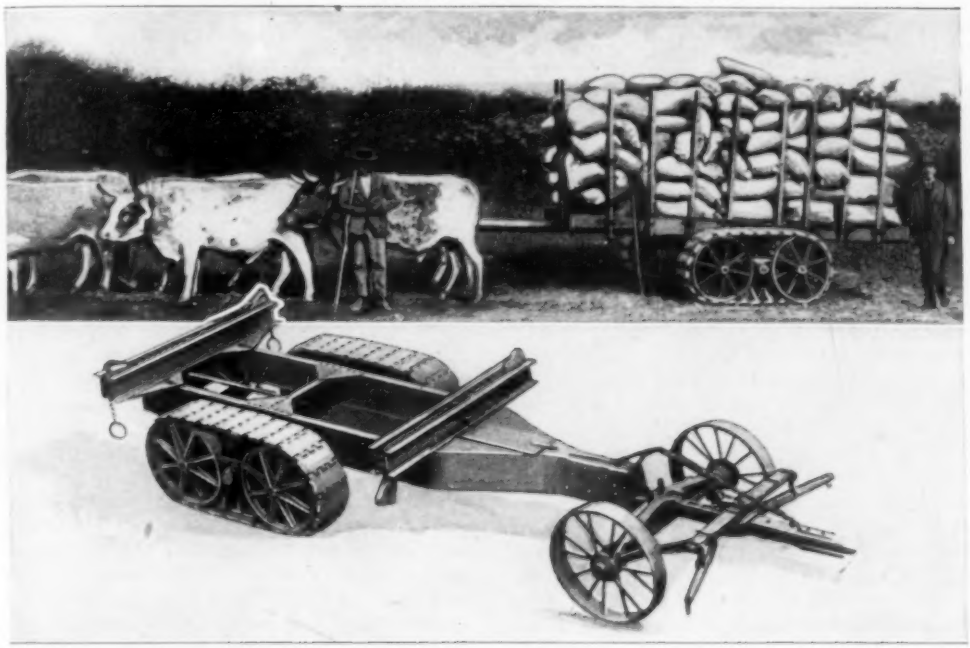
Unscratched by a 10-foot fall from a runway to the top of a high pile of timbers in a middle-western lumber yard, a heavy draft horse was rescued recently by a derrick. The animal lay quietly in its dangerous position while straps were wrapped about its body. It was quickly swung through the air to more solid foot-

Using Derrick to Raise Horse Unscratched by 10-Foot Fall to Lumber Pile

ing, and a few minutes after the accident, was again hitched to a working mate and resumed its daily tasks.

¶Planning to eventually supplant the present telegraph lines with wireless systems, the Canadian government has sent a party to the Yukon to erect the first two of a series of four radio stations, which will be equipped with powerful receiving and broadcasting sets.

TANK TREAD BUILDS OWN ROAD FOR OXCARTS

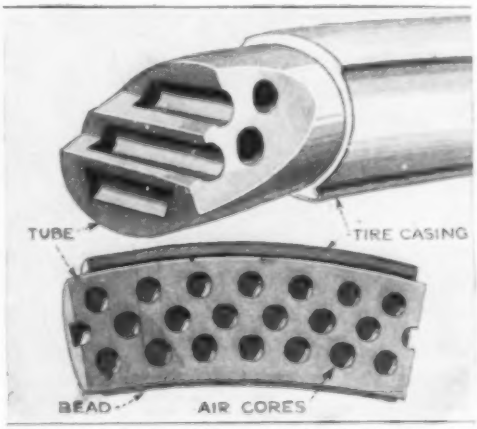


Above: Oxcart Fitted with Tank Tread that Makes Hauling over Rough Roads Light on the Animals. Below: Steel Frame of Horse-Drawn Truck with Banded Wheels

For hauling heavy loads over mud and sand, an animal-drawn truck is being built with wheel treads like the army-type tractors. It is claimed that they can be used anywhere—over cane fields, through logging woods, or behind motor vehicles. Wherever oxen can walk or tractors can travel, they make it possible to haul heavy loads with remarkable ease. Mud picked up by the truss bands is sliced off as though cut by a knife, when they come together at the top.

AIR IS VULCANIZED IN TIRE TO AVOID PUNCTURES

In an effort to make an unpuncturable and undeflatable tire, a French inventor has perfected a process for vulcanizing rubber over compressed air. In its completed form, the tube contains several hundred individual compartments, each of which is inflated under equal pressure. Every "pocket" is a separate leakproof chamber in itself and ranges, according to the size of the tire, from half an inch to three-quarters in diameter, the length being governed by the tube size. It is manufactured from what is said to be a secret rubber compound, the holes being drilled separately. Over this form is laid rubber of another composition to inclose the holes, into which air is then pumped and the whole vulcanized. The outer wall of the tube is three-quarters of an inch thick, making it practically impossible for a nail or other sharp substance to enter the compartments. Once adjusted to the wheel no further inflation is required by it.



Puncture-Proof Tire Filled with Small Air Chambers that Needs no Other Inflation

U. S. Warships on the Auction Block

Tons of Chopped-Up Metal All that Remains of Historic Vessels; Powerful Guns Broken into Scrap

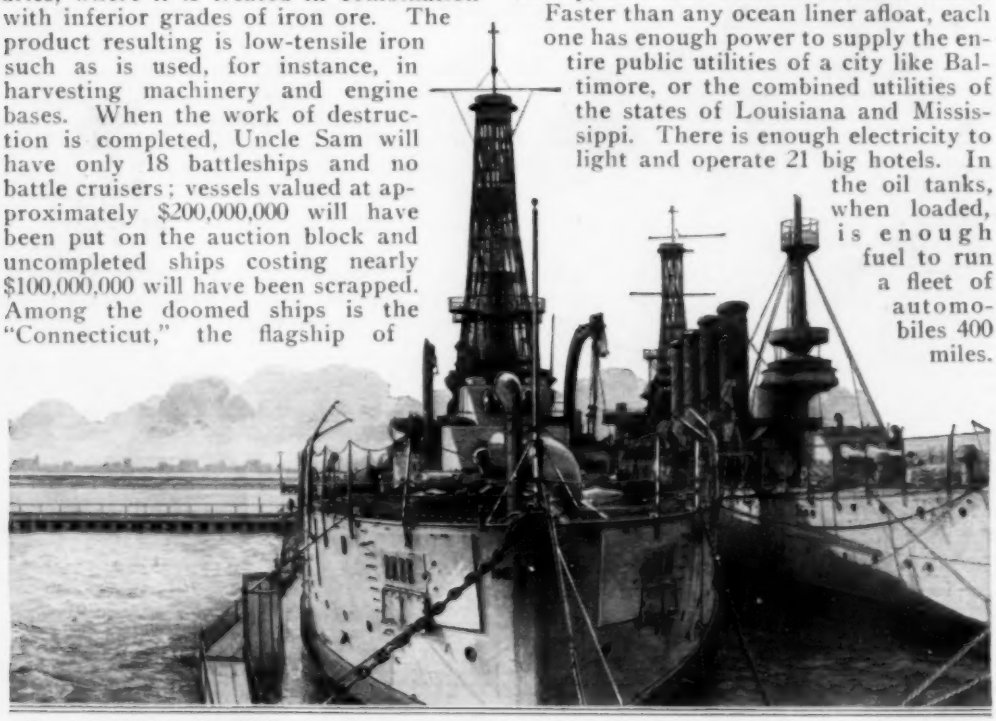
CHOPPED into junk, all that remains today of a score of historic warships of the United States Navy is a mass of twisted metal. Condemned under the disarmament treaty, their guns have been spiked, their engines dismantled, and their costly equipment put out of commission.

First, the side armor plate was removed from the inside shell of teak in sections weighing from 25 to 40 tons. These were swung to upright positions and cut with oxyacetylene torches into pieces of a convenient size for feeding into the charging boxes of steel furnaces, where they will be remelted and, later, reforged.

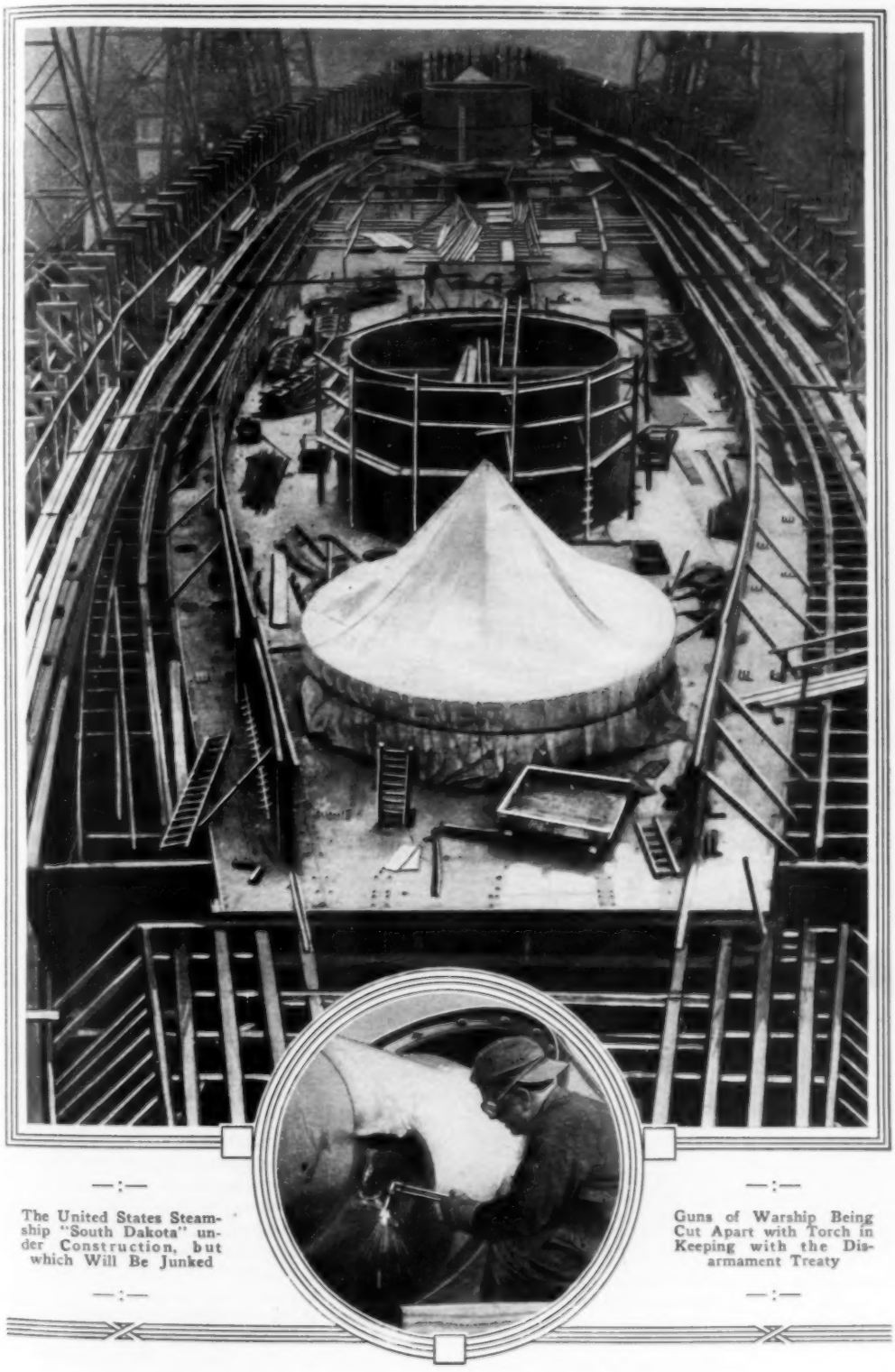
After removing the steel plates, the "nerve centers" of the ships, such as gun-turret machinery, ammunition hoists, and refrigerating systems, were taken down. These were broken up by workmen and then reduced to small scrap by pile drivers with a 110-ton impact. Scrap, thus obtained, is sold to the gray-iron foundries, where it is treated in combination with inferior grades of iron ore. The product resulting is low-tensile iron such as is used, for instance, in harvesting machinery and engine bases. When the work of destruction is completed, Uncle Sam will have only 18 battleships and no battle cruisers; vessels valued at approximately $200,000,000 will have been put on the auction block and uncompleted ships costing nearly $100,000,000 will have been scrapped. Among the doomed ships is the "Connecticut," the flagship of "Fighting Bob" Evans on the famous cruise around the world, and several that former President Roosevelt ordered to circumnavigate the globe at the time, to "fight or frolic" as the case might be.

Among the ships remaining are the new light cruisers, "Detroit," "Milwaukee," "Marblehead," "Omaha," "Cincinnati," "Raleigh," "Concord," "Richmond," "Trenton," and "Memphis." Three outstanding features of these vessels are: First, the tremendous speed obtained; second, a powerful offensive battery, and, third, a cruising radius large enough to make any of the seven seas their home. In describing the "Concord," all of the light cruisers are pictured, as they are sister ships. Imagine a ship seven times as large, and built with streamlines of a destroyer. Five hundred and fifty-five feet in length, with a beam of about 55 feet, they have the foremast of the tripod type found in the British navy, the mainmast of straight spar variety, and four funnels between masts.

Faster than any ocean liner afloat, each one has enough power to supply the entire public utilities of a city like Baltimore, or the combined utilities of the states of Louisiana and Mississippi. There is enough electricity to light and operate 21 big hotels. In the oil tanks, when loaded, is enough fuel to run a fleet of automobiles 400 miles.



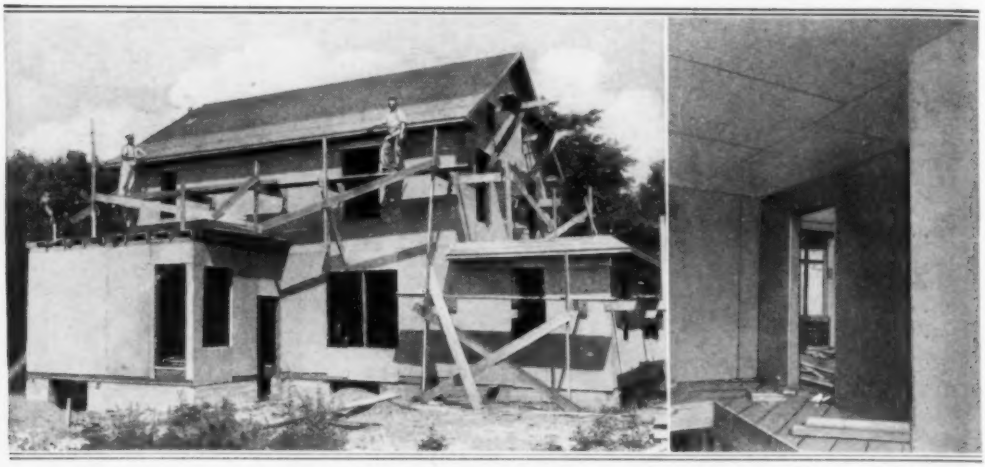
Historic Battleships, the "Nebraska" and the "Georgia," that Are Being Junked at the Mare Island Navy Yard Where Their Guns Have Been Spiked and Their Engines Dismantled



The United States Steamship "South Dakota" under Construction, but which Will Be Junked

Guns of Warship Being Cut Apart with Torch in Keeping with the Disarmament Treaty

SUGAR-CANE "LUMBER" RESISTS HEAT AND COLD

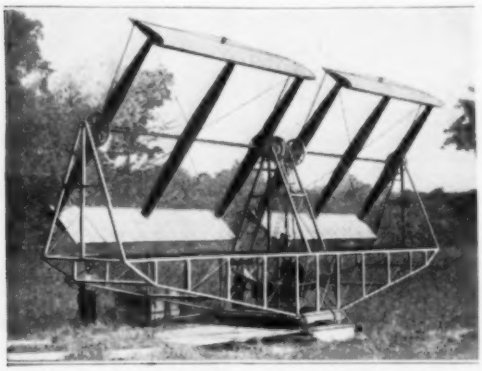


Lumber for this Dwelling Is Made from Fibrous Wastes Left after Sugar Cane Has Been Crushed. Right: Wall Board of the Same Material Utilized for the Interior

Bagasse, the fibrous waste which remains after sugar cane has been crushed, is now being made into insulating lumber that is strong and tough, and light in weight. It can be sawed, painted, grained, stained, or stuccoed like ordinary timber, and is adaptable for sheathing, plaster base, and interior or exterior finish. In addition to its cheapness, it tends to keep out the cold in winter and the heat in summer. Discovery of the process came after years of experiments, and now thousands of tons of it are transformed into wood substitute. Entering the plant, bagasse is fed through a shredder and cooker, the pulp mixed with a waterproofing substance, and then run through a machine which presses it into boards 12 feet wide. It is then cut into standard widths and lengths.

AIRPLANE WITH MOVING WINGS TO RISE FROM HOUSETOP

Intended for rising out of narrowly limited spaces or from the roofs of ordinary buildings, an airplane which has wings that resemble paddle wheels is being built by an inventor. These, with forward motion, will carry the machine up, down, ahead, or backward, according to the designer, who expects his craft to even stand still in mid-air without changing the direction of the wings' rotation. It gets its power from an airplane engine, which drives the propellers by means of chains.



Helicopter with Revolving Wings that Is Designed to Rise Directly from Narrowly Limited Spaces

BOUQUETS IN BLOOMING TREES INCREASE ORCHARD'S YIELD

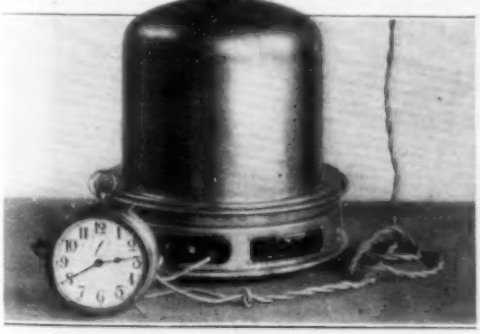
Placing fresh bunches of flowers in the tops of his orchard trees several times during the blossom season, resulted in a large increase in the yield of fruit for a Washington grower, according to a recent announcement. The first test was made when bouquets of blossoms from a certain kind of cherry tree were put in three orchards of other varieties. The pollenization, brought about by bees, flies, and other insects, produced a record crop. Flowers of plum, peach, pear, apple, and cherry trees have been mixed in this way after their buds have opened, greatly benefiting the quality and yield of fruit, it is reported.

PAPER MONEY BECOMES FAD OF COLLECTORS

Collecting foreign paper money, issued by cities during periods of financial stress, is reported to offer profitable diversion. The script is usually redeemable after certain lengths of time, and if not presented then, becomes valueless as exchange. Known in Germany and the surrounding countries during the war of 1870, its use became widespread in the world war and the years that have followed. Some of them now are rare and command high prices from collectors. As the practice of making "notgeld," as it is called in central Europe, under the sanction of the Reichbanks grew, the designs became more ornate, and from 1918 to 1922, leading artists, engravers, and printers were employed to produce them. Many of the scripts picture historical and romantic incidents of a community. A town that claims the distinction of being the birthplace of Baron Munchausen illustrates some of his alleged feats on its money.

CLOCK STARTS COOKER'S HEAT, FOOD CAN'T BURN

Watching food to prevent burning is not necessary with an electric stove being made, whose heat is automatically kept at the proper point through a switch controlled by a clock.



Electric Stove Controlled by Alarm Clock that Keeps Heat Below Burning Point after Food Is Cooked

By setting the timepiece, current can be turned on at any predetermined time and the oven will not remain sufficiently hot to burn its contents, after they have been cooked. To keep odors from escaping, the steam is condensed on the inside of the cover and retained. As water is not required, meats may be cooked in their own juices. Of small size and easily carried about, the stove may be set up at any place where it can be connected to a light socket.

GAS MASK AND RUBBER GLOVES TO PROTECT PAINTERS

To safeguard painters against lead poisoning, frequently contracted while working with materials containing that min-

Protecting Gloves and Mask for Use of Painters to Guard Them from Lead Poison

eral, a respirator and rubber gloves have been devised. Without discomfort or inconvenience when worn, these articles prevent the workmen from getting the liquid on their hands, which may result in irritating skin diseases, or breathing the fumes, said to be injurious to the lungs. Strapped over the head, the mask does not obstruct the craftsman's sight.

NATURALISTS LEARN OF EARTH CHANGES BY STUDY OF BUGS

Studies to determine changes in the earth's crust that occurred millions of years ago have been aided by bugs, according to scientists, who explain that the relations insects of one region bear to those of another indicate that certain islands were once connected. In Jamaica, recently, they explored a very ancient section of that country that has been above the sea for a longer time than its neighboring land and which shelters insect tribes of great age. This discovery leads authorities to believe that animal life of that isle is more closely associated with those of Haiti or Cuba, and that it originally found its way from the mainland over a land bridge, long since engulfed by the ocean.

With Teeth that Cut Like Steel and Giant B'ows from Powe-ful Paws, Two Polar Bears, Twisting and Writhing Like Acrobats, Locked for a Strugg'e to Death in Their Zoo Tank

POLAR BEARS FIGHT DEADLY BATTLE IN ZOO TANK

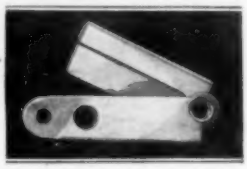
In their tank in the London Zoo, two polar bears in deadly combat, attacked each other with such ferociousness that only the timely interference of the keeper prevented the death of one or both of the captive beasts. The other animals in the building became panicky from the roars of rage and pain set up by the mad brutes. Their powerful jaws, penetrating the heavy fur, sank teeth sharp as steel into each others' throats, while giant blows of their paws whipped the water into foam. After a hard struggle the attendant succeeded in prying the battlers apart. Neither showed signs of exhaustion.

BANK ON OCEAN LINER SERVES THOUSANDS EACH TRIP

Banking accommodations are available to passengers on the giant ocean liner, "Leviathan," through a branch established aboard the ship by an eastern trust company. An average of about 4,000 persons take advantage of the service each trip—a larger number of patrons than some bigger institutions ashore are called upon to serve in a week. The main business is cashing travelers' checks and drafts and changing money from one form of currency to another. On the trip to Europe the latter transactions are confined mostly to exchange of dollars to pounds and francs, but on the return, the company takes in almost every kind of foreign money, for which it pays in American coin at the rates of exchange received by radio from the main office. It also issues letters of credit and pays money on wireless orders from London, Paris, and other big cities. While the bank does not handle stock deals, it bulletins each day wirelessed quotations which are in great demand.

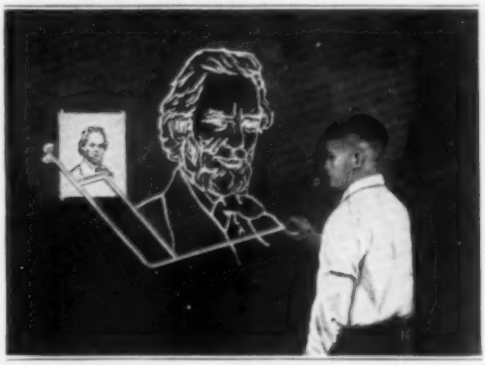
PENKNIFE LIKE SAFETY RAZOR HAS CHANGEABLE BLADES

Flat as a key, a penknife is being made with a safety-razor blade, which can be replaced when it becomes dull. After cutting edges have been discarded as unfit for shaving, they may be used in the holder as an eraser, clipper, pencil sharpener, seam ripper, and glass scraper, or for many other purposes.



CHALK DRAWING IS MADE EASY BY AN EXTENSION ARM

To assist school-teachers in sketching on blackboards, a pantograph has been made with which even the unskilled can make enlarged copies of maps, figures, and charts. It operates quickly and easily and reproduces illustrations up to 32 inches square. As it marks either lines or dots, it may be used to indicate the extreme points of a figure, and these may be later connected by free-hand work, thus providing a means of training pupils. Drawings that only skilled persons can create, may be copied on the wall, adding to the attractiveness of the schoolroom. While designed primarily to aid in saving instructors' time, it helps them in their teaching, for subjects being studied can be pictured in crayon.



Form of Pantograph that Can Be Operated by Anyone for Enlarging Drawings on Walls

NERVES OF EARTHWORMS HELP THEM TO REMEMBER

Earthworms have memory and can be trained, according to a scientist who recently conducted an experiment with 500 of them. In the tests, they were put in a T-shaped receptacle, covered with glass. As they crawled to the crossway, about half turned one way and half the other. Those that took the left-hand course were given a mild electric shock. After going through this experience about 200 times, nearly all took the right turn. When the current was changed to that side, they learned to shift their route after only 65 trips. When cut in two, the fragments of a worm's body showed ability to distinguish between the two roads of travel, indicating that they remember with every one of their nerves, which are on the under part of their bodies.

RIVER CUTTING NEW COURSE UNDERMINES SHORE

In Cutting a New Course, the Strong Current of the Mississippi River Undermined a Large Section of the Bank, which Collapsed and Caused Great Property Loss

Against the high bluffs that form its shore in Tennessee, the Mississippi River is waging relentless warfare. Large sections of the bank become undermined and topple into the water, carrying with them whatever structures they might support. The swift stream is cutting a new channel at this point, that even breakwaters have not been able to prevent. A part of the bank was worn away recently to such an extent that a wide piece of land collapsed, taking with it the entire plant of an industrial concern, and causing a big property loss at other points.

Engraver Examining Pin Head on Which He Carved Portrait and Name of Late President Harding

PORTRAIT OF HARDING CARVED ON HEAD OF PIN

On an ordinary pin head, an eastern engraver recently carved the portrait and name of the late President Warren G. Harding. From this, a die was made to be used in manufacturing large quantities of the novelty, and the artist has invented a press by which the "copies" can be stamped out. He also engraved the national capitol building in the same way as another example of his expertness.

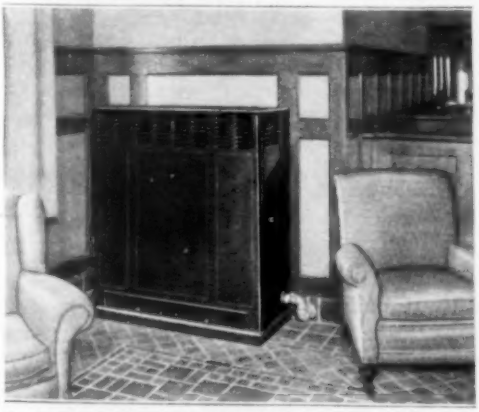
¶The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the Bureau.

ANCIENT TABLETS TELL STORY OF NOAH IN PARADISE

Ancient tablets, unearthed in Mesopotamia and recently translated, tell a story of a race of men created from clay by a feminine deity, who when the great flood came, protected her creations by saving Noah and guiding him to Paradise. There, according to the records, he fell from grace of his own accord, the incidents following somewhat those related in the book of Genesis, but in a different order. The documents describe how the Sumerians, a race of unknown origin, worshiped their gods, how their ceremonies were performed in the temple of Nippur, corresponding to Rome in our day, and give a valuable insight to the manners of life 5,000 years ago, according to scientists.

AIR WARMED IN STEEL CABINET CONTROLLED BY PUSH BUTTON

To cut the cost of heating in a building where all space is not continuously occupied, small steel-cabinet heaters, for individual use in rooms, are being made in the middle West. By pressing an ordinary push button, the temperature can be raised in a few minutes. Drawn inward by the machine, through an opening to the outside, clean air is warmed to the desired degree and blown by its fans so that drafts are avoided. The device, which is motor-operated, is built of sheet metal and can be placed on the floor, or where space is scarce, it may be supported overhead on brackets or put on a platform against a wall.

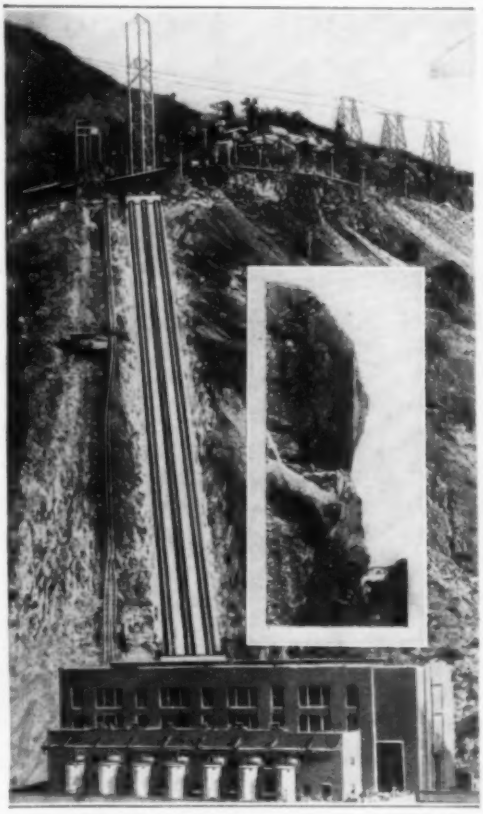


Fresh-Air Heater Cabinet, that Is Operated by Push Button, for Individual Use in Rooms

¶Recent investigations show that nearly 80 varieties of mushrooms are poisonous.

TUNNEL BORED INTO SIERRAS GETS WATER FOR POWER

Generating 105,000 horsepower, what is believed to be the largest water-power elec-

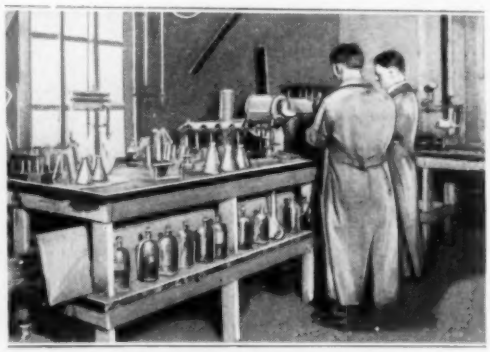


Where Water Begins Its Toil for Farm and Factory: Insert, Near Tunnel Mouth

tric station in the Pacific West, recently was placed in operation. From the San Joaquin River far up on the slopes of the Sierras, water is carried six miles by a tunnel and dropped 760 feet through three immense pipes to turn the wheels of this plant. The electricity is spread over a system of some 300 cities, towns, and rural communities in southern and central California. In this territory it serves 60,000 homes, 500 factories, and furnishes energy for irrigating 260,000 acres of land. Its present capacity is capable of being doubled when the Florence Lake tunnel, nearly 14 miles long, and reported the largest in the world, is completed. This excavation will make possible an output of 1,407,000 horsepower. Current from the present works is transmitted over lines in some instances 275 miles in length, at 220,000 volts pressure.

SEWAGE PLANT OF CITY FACTORY FOR FERTILIZER

In disposing of its vast volume of sewage the city of Chicago has undertaken a process of converting the waste to fertilizer. Even the industrial refuse alone is heavily laden with materials that enrich soils and are necessary in the cultivation of farm lands. The sludge is first activated by blowing air bubbles into the liquid and changing the solid matter to a dry, lumpy product. After this is removed, a fluid remains that is so clear and clean that fish can live in it, and any water stream that it might enter is not harmed by it. An experimental farm has been operated to determine the value of the fertilizer as compared with various others. It has been highly successful when sown with corn, bush beans, and sugar beets. It is also being used to improve lawns in the parks, and growers of roses and peonies have made use of it for the treatment of rare species of flowers, while cotton raisers of the South have entered on trials with the article. With this process it is believed that not only better sanitation will result, but the production of the fertilizing materials will offset the cost of the installation of the drainage plants.



Chemists Are Constantly Analyzing the Sludge in Search for Matter that Enriches Soils

Experimental Farm, Surrounding Sewage Plant where Fertilizer Undergoes Tests in Actual Use with Various Crops: Its Effect on Each Is Carefully Studied and Compared with Other Materials

SNOWFALL OF TODAY AS HEAVY AS IN GRANDPA'S TIME

Official records, according to the weather bureau, will not support the assertions that "we don't have such heavy snowfalls now as we did when I was a child." According to the figures, the winters now are just as severe as they were in the days of our grandparents. It is a fact, say the experts, that the deep snow remembered by the man who was a boy in the '70's or '80's, which reached his shoulders, would be less than knee deep compared with his present stature. For example, the statistics show that in New York City and Albany, N. Y., the heaviest snowfalls occurred more than 30 years ago, but there have been few winters with more snow than fell at those places in the season of 1915-16. Records at Springfield, Ill., dating since 1884, indicate that the greatest fall, 43 inches, was in 1913-14. In New Haven, Conn., the heaviest occurred in 1915-16, although there seems to be a gradual lessening of the total each season. Boston's best figure, 96.4 inches, was in 1873-74, but two years later there was only 5.3 inches, while Portland, Me., experienced 125.5 inches in 1886-87; last winter's total was only ½ inch less.

NEBRASKA ONCE HOME OF APES UNEARTHED TOOTH SHOWS

Scientists unearthing fossils in Nebraska have found a tooth, which they say belongs to a prehistoric ape and shows that such an animal once lived in that region. The skull of a giant camel was also dug up, together with bones of piglike beasts as large as a rhinoceros. Remains of a three-toed horse are among the collection, which according to the discoverers, proves that this animal roamed America more than 2,000,000 years ago.

FAILURES OF LIGHTNING ROD CAUSE SLUMP IN ITS USE

Though 75 years ago there were lightning rods in every hamlet in the United States, it is said that a government report, citing many failures of conductors to protect property, has caused such a slump in their use that today the government census does not record one factory making the apparatus. Invented by Benjamin Franklin in 1752, this protection against the dangerous electrical flashes was widely used until the report of the Lightning Research Committee in 1905 caused the public to lose faith in its value.

TREES DYED ANY COLOR WITH CHEMICALS THAT CURE WOOD

Copyright, Underwood & Underwood

Dyeing the trunk and branches of a living tree any desired color, and at the same time curing the lumber, thus eliminating the necessity of seasoning when it is cut into boards, can be accomplished in two days with a process recently invented by two eastern chemists, they assert. The cost is less than one dollar a tree. Fluids pass through a rubber hose from a tank to holes that are bored in the trunk close to the ground. These colors are absorbed by the tallest tree, giving it the tint of the mixture.

PLYMOUTH ROCK TRANSPORTED FROM CANADA BY GLACIER

Examination of Plymouth Rock by a scientist recently has established the fact that it was carried from Canada perhaps 40,000 years ago by one of nature's freight cars, the huge glacier that at one time covered the northern part of the continent with ice. When this huge sheet began to melt and recede, tons of bowlders and silt were deposited over New England. Among the huge stones was this historical rock which welcomed the Pilgrims.

PULLING SHIP'S "TEETH" TAKES CRANE AND HUGE FORCEPS

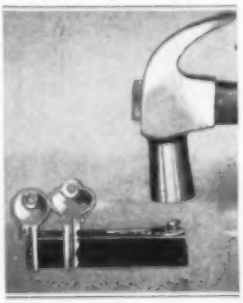
Occasionally an ocean liner requires the services of "dentists," if it is to be kept in good condition. Its "teeth" are its bow

Cable and Crane Drawing Steel "Teeth" or Bow Plates from Hull of Vessel for Repairs

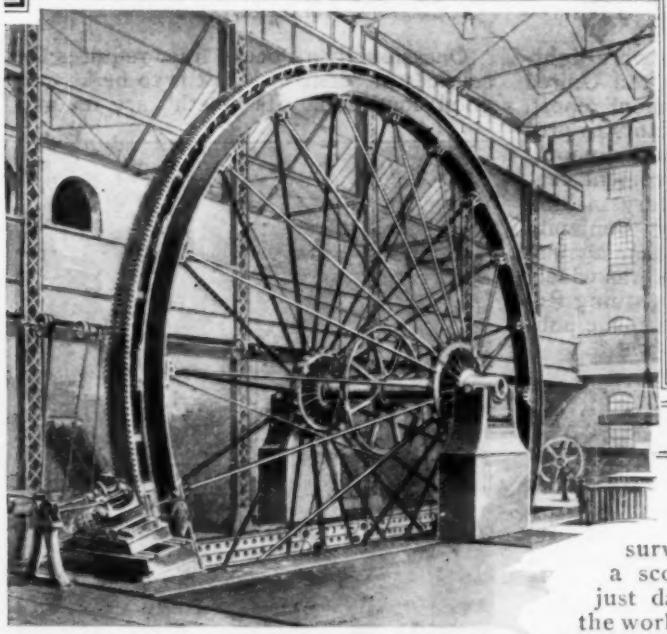
plates, which, in a measure, protect the forward part of a vessel's hull from injury in case of collisions with other boats or submerged wreckage. A crane and forceps 10 feet high, are used to remove these strips of armor, when they are to be replaced by new ones. But they must first be loosened by workmen before they can come away without damaging the craft.

NAME PLATES ON KEYS HELP IDENTIFY THEM

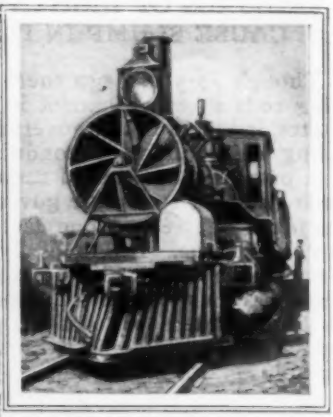
Small name plates, designed to aid in identifying the door or receptacle which any particular key opens, are being made in the form of eyelets that clamp into the hole. These tags, which are neat in appearance and do not interfere with attaching the key to a ring, are printed with luminous paint which may be read at night. The name plates are easily attached, simply by the use of a hammer, a blow clinching them into place like a rivet.



Two Decades Ago in Popular Mechanics



Million-Pound Sand Wheel for Stamp Mill

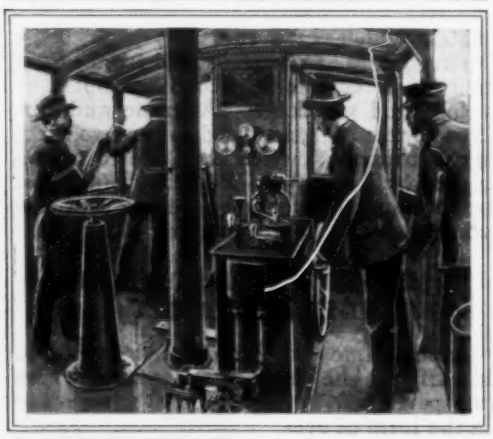


Windmill on Locomotive to Light Train

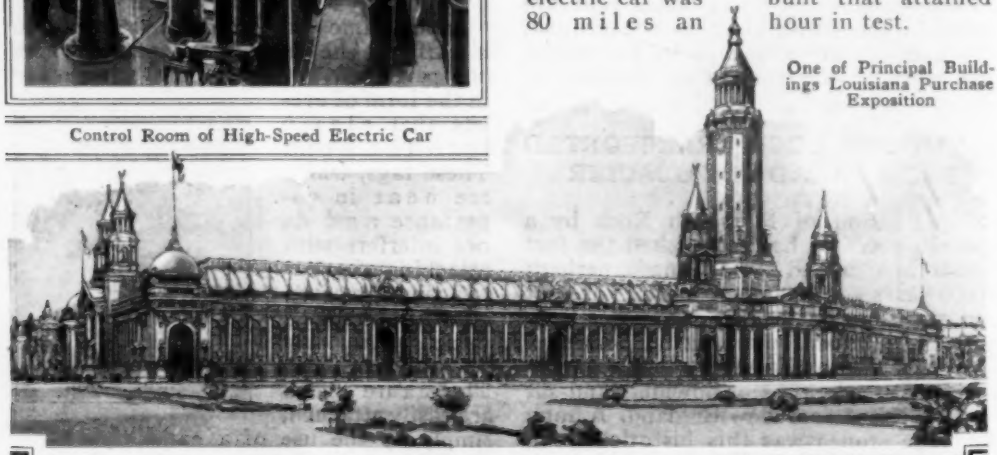
WHEN Popular Mechanics Magazine surveyed the field of invention a score of years ago, 1904 was just dawning, full of promise for the world in general. The past twelve months had seen the growth of the Louisiana Purchase Exposition at St. Louis, that was to memorialize a century of progress.

In industry, the mining world marveled at a giant sand wheel weighing a million pounds that was to lift gravel, water, and sand from a stamp mill to a trough 65 feet in the air. Locomotives were expected by one inventor to help light the passenger trains they hauled, by means of a rotary fan that operated from contact with the wind.

Speed in transportation, then as now, was sought by the traffic world and an electric car was built that attained 80 miles an hour in test.



Control Room of High-Speed Electric Car



One of Principal Buildings Louisiana Purchase Exposition

RUINS OF OLD CITY FOUND MAY ANTEDATE ROME

Buried under debris which covered the graves of its inhabitants, and had almost obliterated carvings on fragments of buildings, the ruins of a city thought to be 1,000 years older than Rome have been found near Ferrara, Italy. More than 100 tombs with the remains of persons buried in them and containing vases decorated with designs resembling Grecian forms, bits of jewelry, and wearing apparel, have been unearthed. Pieces of stones, which were evidently part of a large temple, are being put together in an attempt to decipher the inscriptions. Some experts say that the ruins may be those of the town of Spina or of an Etruscan city, whose people spoke some language now unknown.

EXPERTS BREAK DISHES TO TEST HARDNESS OF CHINA

Striving to establish standards of strength for china and porcelain, an expert in a government bureau smashes dishes daily with an apparatus built especially to measure the force of blows required to break various kinds of crockery. Hanging over the frame on which the dishes are placed is a weight that is pulled back and then swung against the piece

Breaking Dishes in Government Bureau to Help Establish Standards of Strength for China and Porcelain

being tested. Noting the angle to which this hammer is raised for the blow, enables the tester to compute its force.

¶Bags for the storing of grain are now being treated to make them weevil-proof.

GLIDER WITH RAISED MOTOR SPEEDS ON TOP OF WATER

While running 70 miles an hour on the surface of the water, a recently invented hydroglider is said to use only half the

Hydroglider that Is Driven on Water's Surface by Raised Motor that Saves Gas

amount of gasoline consumed by other types. The craft is almost entirely above the surface, when traveling more than a mile a minute, drawing little more than one inch of water. Mounted above and behind the passengers, an air-cooled motor turns the airplane propeller blades. Wind rushes through a large opening in front of the hood that covers the engine. With airplane tail several feet high, wide pontoon sides, a cabin that resembles a war tank, and the elevated engine, the ship presents an unusual appearance. For three years the inventor worked to perfect it.

CONCRETE WHEEL BLOCK LOCKS AUTO TO BOX-CAR FLOOR

For safely anchoring an automobile while it is being shipped, a concrete block has been invented, which locks the machine's wheel to the floor of the freight car, making movement impossible. Weighing only a few pounds, it can be quickly placed in

position, and as easily removed. Its face is concave, so that the inflated tire fits readily into it. The device then may be returned to the factory for further use or may be used in the garage, replacing the wooden stops, which are inferior in wearing qualities.

Washing a Mountain into the Sea to Make an Extension of New Land for a South American City's Business District: Seven Million Cubic Yards of Ground Were Transferred

WASHING A MOUNTAIN INTO THE SEA

Contractors years ago began to move a mountain from the heart of a South American city into the sea. They used mule-drawn carts to haul the soil and rock away to be dumped inside the sea wall that marked the limits of a new water front. Shortly after the work was started it was estimated that under this method the cost would be almost prohibitive, and that the task would require eight years. It was finally decided to wash away as much as possible of the hill with hydraulic force. Twelve giant streams of water under pressure from three high-powered pumps were turned against the mountain, and it slowly began to crumble downward. At its summit stood an old monastery, erected by the early residents of the city. Abandoned by its former occupants, it fell with the ground that supported it. Stones too large to be moved by the force of the water, were broken up by dynamite and sluiced away. Over 7,000,000 cubic yards of earth and rock have already been poured from this hill into the bay, making an extension to the shore three miles wide. Sixty new blocks will be available to the business section of the city when the transfer has been completed. Since the more modern methods of destruction were adopted two years ago, dynamite, steam shovels, construction trains, dirt trucks, hydraulic equipment, and human energy have been tearing at the obstruction. Hydraulic pumps and dredge pipes have replaced steam shovels, dirt trucks and trains.

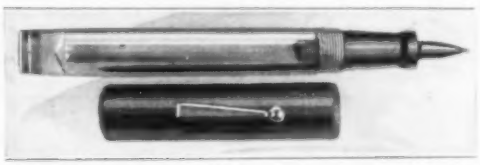
Abandoned Monastery Crumbles as Man's Forces Destroy Nature's Obstruction on which It Stood for Years

NEEDLE, ONCE BONE OR STICK, STAMPED FROM WIRE

Needles for the sewing baskets of housewives or the machines of factories had their beginning at the hands of prehistoric man, who made them from sharp bones or sticks through which he punched holes for the threads. Fine steel wire supplied in coils is now used in their manufacture. Powerful shears cut it into pieces, each long enough for two needles. Several thousand of these, bound in a bundle, are made red-hot and straightened by pressure and rolling. Both ends are then pointed on a grindstone. The eyes are stamped, with the two heads, at the center of the length, in one operation. Through these perforations thin wire is threaded and the needles are broken apart. Tempered by fire and an oil bath, they are then scoured, washed, and polished. This requires much labor, for the process is repeated.

INK SUPPLY OF FOUNTAIN PEN SEEN IN CLEAR STEM

So the user can tell when its ink supply is low, a fountain pen recently placed on the market is fitted with a stem of transparent material. It is said to hold a much larger quantity of writing fluid than many other models do. The article is made with either ordinary pen points or a pencil tip.

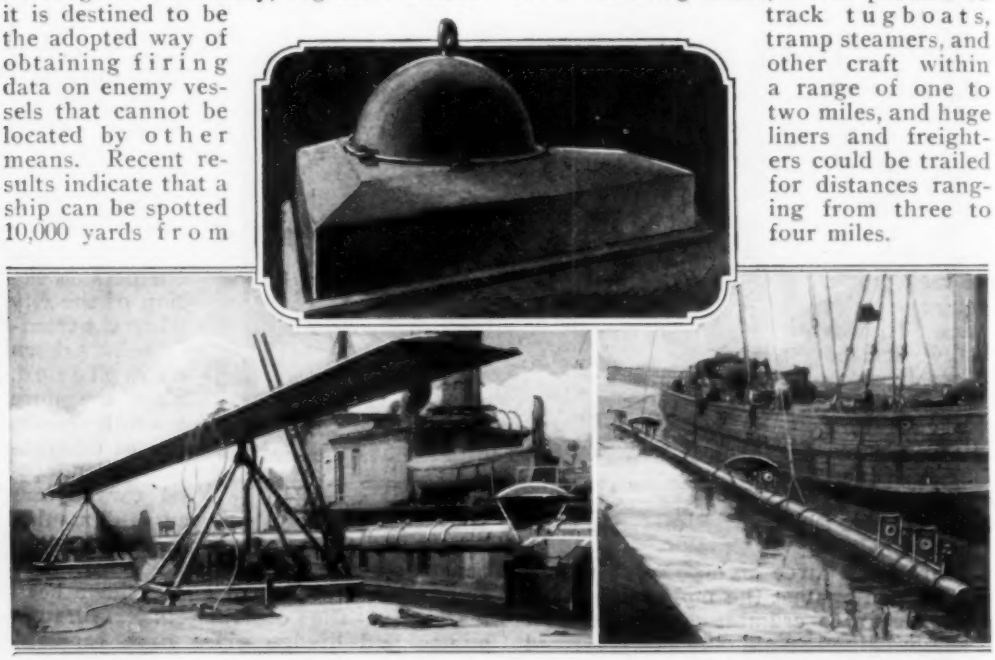


Fountain Pen with Transparent Barrel in which Ink Supply Can Be Seen

¶ Manufacture of building paper from sugar-cane waste has been developed.

SEAPHONES TRACK "FOOTSTEPS" OF UNSEEN CRAFT

Trailing unseen ships as they plow their ways over the ocean has been developed as part of the United States coast defense through the invention of delicate submarine phones. The system, known as underwater sound ranging, is manned by a special branch of the Coast Artillery. Although in its infancy, engineers believe it is destined to be the adopted way of obtaining firing data on enemy vessels that cannot be located by other means. Recent results indicate that a ship can be spotted 10,000 yards from shore with an accuracy sufficient to permit shelling, although it may be traveling at full speed. Individual boats are picked out from others by distinguishing sounds, such as an engine knock or squeak and the impulses of its machinery. When the days were calm and there was only one vessel in the areas being tested, it was possible to track tugboats, tramp steamers, and other craft within a range of one to two miles, and huge liners and freighters could be trailed for distances ranging from three to four miles.



Types of Underwater Phones and Sound Detectors Used by the Coast Artillery Service in Tracking the "Footsteps" of Unseen Ships along the Atlantic Seaboard

FRUIT DISPLAY ON MOTOR TRUCK USED BY GROWERS

For exhibition purposes in the creating of new markets, automobile trucks are being used by western apple growers to carry loads of their choicest fruit into the middle West and South. The boxed displays, arranged in tiers, may be viewed by opening the several side doors of the closed cars. Heavy felt lining in the compartments prevents bruising of the products during transit. A few years ago railroad cars were used for a similar service by western farmers and growers.

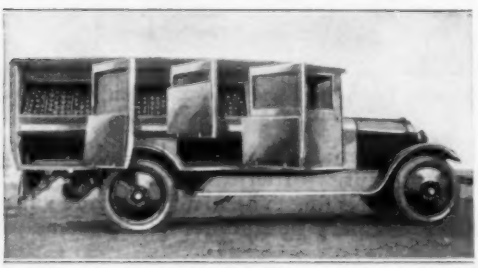


Exhibit of Apples Carried by Auto through Middle West and South to Open New Markets

GLAZE FOR ENAMELED PAPER FROM CHINAWARE CLAY

Clay from which chinaware is made is being used for the coating of highly polished art papers. Applied in a fluid form it is given a rubbing treatment to produce the hard glaze. The material is also employed to a great extent in the manufacture of newsprint, in the preparation of cotton fabrics, and in the chemical industry. Recently a process was discovered by which artificial ultramarine coloring can be made from the clay.

BONES OF PREHISTORIC BRUTES USED AS "MEDICINE"

Fried fossil bones of prehistoric animals are made into healing potions by some Chinese druggists, according to an eastern scientist, and are in wide demand among suffering natives. The "medicine" is taken in powder form, fried with oil in a skillet, or mixed with sour wine. The doses are prescribed for nervous diseases and liver and heart disorders. The bones have been mined, ground, and sold in this strange industry for centuries.

JAZZ INSTRUMENT MINUS KEYS "PLAYED" BY HUMMING

Producing music with a "jazzy" effect, a keyless reed instrument is being made which can be "played" by anyone who can hum a tune. Equipped with a rest, it can be kept in the proper position without being held by the hands, and can be used

Horn without Keys that Produces "Jazzy" Music When "Player" Hums Tune into It

to accompany any selection. Having sufficient volume and carrying power, it is suitable for orchestral work.

"EYES" FOR AIRPLANES AID FLIERS IN DENSE FOGS

Automatic "eyes" to show aviators the heights of their planes when making night landings, or the distance from other objects while flying in fogs, have been demonstrated by an eastern inventor. The device consists of attachments placed on the wing tips and is connected to an indicator in the cockpit. A reading is shown when the craft is within 100 feet of any object, giving the distance in feet.

FOOLPROOF TWO-SEATER AUTO CAR PROPOSED AS TAXICAB

Because of its cheapness of operation, a two-seated auto car recently invented in Europe, is proposed as a substitute for the

Copyright, Keystone View Co., Inc.

Foolproof Auto Car, Proposed as Substitute for Taxicab in Europe, Seats Two Passengers

much larger and more expensive taxicab. It is so simply built, the maker claims, that anyone can drive it without previous experience or training. Somewhat similar in appearance to the side car of a motorcycle, it is propelled by a small engine and guided by a huge steering wheel nearly twice the size of an ordinary one. It has only three wheels, two small ones at the rear, and a larger one in front. Besides the driver, it seats two persons. On heavily traveled boulevards, the machine is said to make rapid headway, as it is able to dart in and out among the larger vehicles.

NOTCHED-EDGE BREAD KNIFE CUTS WITHOUT TEARING

With its sawlike teeth arranged to cut on both forward and backward strokes of the hand, a bread knife is being made that produces clean slices. It goes through a fresh or stale loaf equally as well, without tearing the bread or making many crumbs, as the notched edge does not "pull." Made of hardened, tempered steel, the blade will

Bread Knife with Notched Edge that Cuts Either Stale or Fresh Loaf without Tearing

last for years. When it becomes dull it can be sharpened in a few minutes.

When Pioneer "Ideas" Were Jests

Chance as Well as Necessity Responsible for Origin of Things Believed Indispensable to Mankind

WHILE necessity has long been accredited with being the mother of invention, it is safe to suppose, from the experience of striving geniuses, that accident has had much to do with the birth of a great percentage of the ideas which have astonished, as well as benefited, mankind.

What the loss to the world would have been had the phonograph not been discovered while its inventor was supposed to have been experimenting with the early telephone, is a matter for easy conjecture. Not only has it improved the tenor of life in many homes, but it has rendered aid to the business world in recording dictated letters for later repetition to typists. The industry that it represents has an annual output valued at more than 158 million dollars.

Pictures Pasted on Disks Spun on Pivots May Have Suggested the Motion-Picture Machine

It was not so long ago that an Ohio merchant, while on a trip across the ocean, visited the engine room of the ship that carried him. His attention was drawn to the mechanism which registered the number of revolutions the propeller made each minute. When he returned to his home, he began work on a machine that would record the amount of purchases made in his store. Thus, we are told, was the cash register born.

Each new discovery or amazing invention, although it may be admitted to be the last word in progress, seems only to open the path of research further. After steam was found to be a force that could be harnessed and put to work moving cars and boats, it was soon learned that brakes were also needed to check the momentum of railway trains when stopping. This need led to the airbrake, which in its early days was the subject of much derision among mechanical minds. Today, the rail transportation system that failed to equip its rolling stock with the device would be thought worthy of more laughter than that which greeted its first appearance.

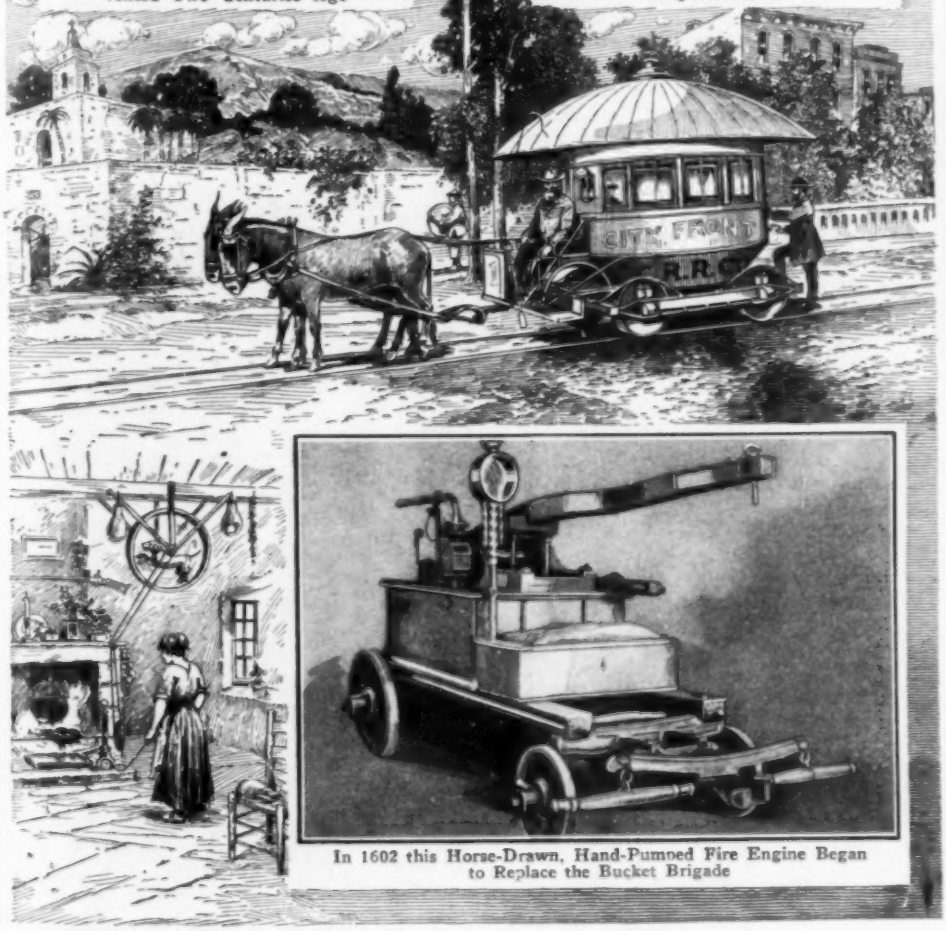
Barbed wire for fences, which has figured prominently in peaceful agricultural pursuits for years, and recently as an instrument of defense in warfare, came from the suggestion of a farmer lad that sharp prongs on metal strands might keep roving animals from forcing their way into grain fields. His father was first to adopt that form of protection for his farm. It may not have worried the intruders so much as it did their owners when their cattle returned home with badly scratched hides.

Had the automatic dial telephone been looking for some one to invent it, it is questionable whether or not it could have reached the Kansas home of another farmer boy who is said to have given the invention to commerce.

From a half-penny toy once made in England, the motion-picture machine is said to have received its start on the road to perfection. This was a cardboard disk with a string passing through its center. On it was a series of little pictures of children at play. By whirling the card on its pivot a sort of motion was given to the figures as they passed before the eye. Later came another contrivance to give movement to photographs. Its origin is credited to two wealthy gentlemen who

This "Writing Automat" Was Invented Two Centuries Ago

Steam and Gases Were Once Tested in Queer Tanks



In 1602 this Horse-Drawn, Hand-Pumped Fire Engine Began to Replace the Bucket Brigade

Center: Early Mule-Drawn Street Car. Left: When the House Dog Worked for the Cook

had a wager as to whether or not a trotting horse lifted all his feet from the ground at the same time while running.

A row of cameras were set at intervals along the path the animal was to take, and at a level that commanded a view of his entire body. As the horse passed each camera it was operated. The resulting photographs were later pasted to a circular metal plate, placed on a pin, and spun rapidly.

In 1780 the first baby buggy is reported to have been built by a coachmaker, for the daughter of an English nobleman. It was patterned much like the horse-drawn vehicles of that day, except that it was pushed by a person walking. What becomes of the thousands of its descendants annually worn out, is a question that might be answered by almost any boy, for the homemade soap-box cart generally looks to the cast-off perambulator for its wheels.

In 1864 the first submersible boat is thought to have been launched off the shores of New Jersey, though several earlier attempts at such a craft had been made without success. However, among the relics in an eastern navy yard may be seen a forerunner of the elusive submarine boat that picks its path beneath the waves, and rises at will under the impulse of powerful engines. This first device was propelled by hand and carried a crew of ten men. In size it was inferior to many whales which it must have resembled as it slid slowly through the water. Although dependent on man power for its motion, a speed of four knots an hour is said to have been attained under "full steam."

It was about fifty years before the appearance of the underwater craft that the pioneer ship of the steam navies was slid into the sea. Unlike its modern prototypes, it was constructed entirely of wood with the exception of the machinery that was to drive it through the waves. A half century later the ironclad sides were added to the fortresses of the seas, and became a standard that was to revolutionize the building of battleships.

In like manner the locomotive has superseded the steam wagon, and the dirigible airship has grown from the balloon.

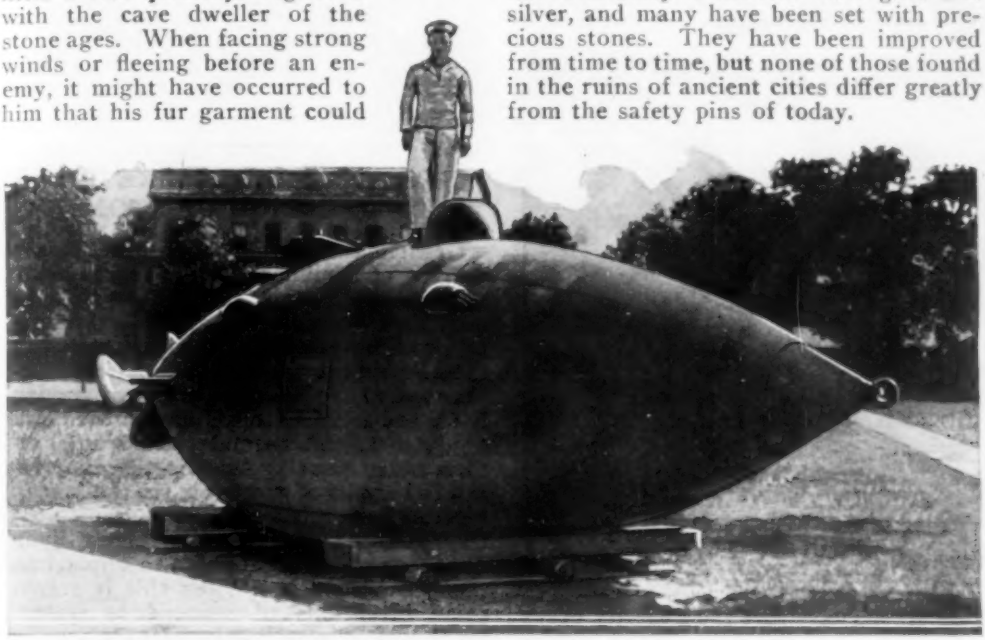
Among the simple articles of everyday use which have come down to the present day out of a past that is all but lost to history, is the safety pin. The Romans had them, and so had the early Egyptians, and

Alchemists of Olden Days Led Secluded Lives of Study and Research in Ill-Lighted Laboratories Fitted with Odd Contrivances that Often Disclosed Amazing Secrets

they were probably old when Greek civilization was new.

It is interesting to note that this handy little article possibly originated with the cave dweller of the stone ages. When facing strong winds or fleeing before an enemy, it might have occurred to him that his fur garment could be kept secure by tying one end of a fastening bone pin about another with a cord.

Some of them to be seen in museums are artistically fashioned from gold and silver, and many have been set with precious stones. They have been improved from time to time, but none of those found in the ruins of ancient cities differ greatly from the safety pins of today.



Once Called "Mechanical Whale," the Forerunner of the Deadly Submarine Was a Comparatively Small Affair which Was Operated by Hand but Carried a Crew of Ten Men

NATURE'S "MELTING POT" FOUND IN SOUTH AMERICA

Among the mountains of the west coast of South America, explorers have found four distinct zones of plant and animal life, all within an area of a few miles. On the snow-capped peaks live birds and beasts akin to those that inhabit the polar regions, while lower down toward the valleys conditions and creatures exist similar to those of temperate climates. From there, it is but a step to the abode of tropical animals.

HAND PUMP FOR DRAIN PIPES REDUCES PLUMBING BILLS

Designed to reduce plumbing bills and to save housewives the inconvenience of torn-up floors and pipes, a small hydraulic lift and force pump for removing obstructions from clogged drains, sink traps, and other outlets, is a recent invention. The device is adapted to fixtures of standard size but may be quickly changed for odd-size pipes. A spraying nozzle can also be used for garden purposes, and as a radiator cleaner for blowing out accumulated rust and dirt before the steam is turned on.

BRASS HORN TWELVE FEET LONG PLAYED BY SIX MIDGETS

Measuring 12 feet in length, a giant horn requires at least two men to play it, as it is so cumbersome that one person cannot carry it. Recently, at a convention in the South, six midget men were necessary to handle the instrument: one at the mouth-

Massive Brass Instrument that Is Played by Two Midgets while Four Others Hold It

piece, another at the keys, and four to support it. This huge band piece was made in Paris and brought to this country about 75 years ago.

ACCIDENTS IN BIG CITIES OCCUR ON STREETS MOST CROWDED

Keeping tab on traffic accidents in a large eastern city by spotting them on a

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Map that Shows Proportion of Accidents Occurring in Busy Streets of Large City

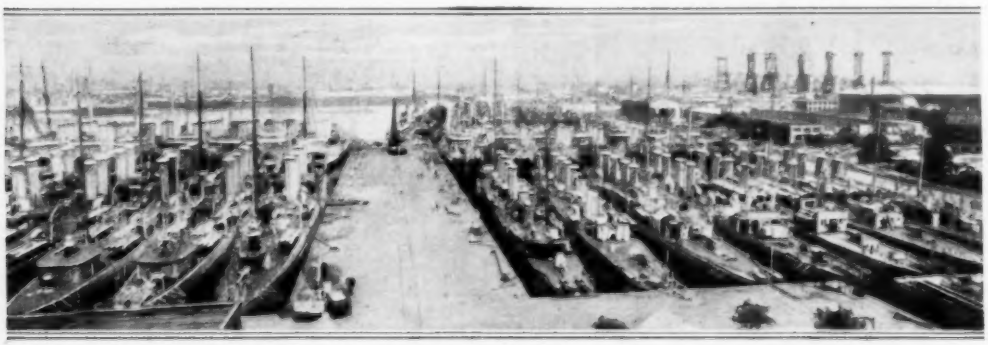
street map, shows that the majority occur in the congested business district, where great numbers of vehicles and pedestrians gather. On the more passable boulevards, where greater speeds are permitted to automobiles, the number is less. Pins of three different colors indicate the scenes of the mishaps; red for a fatal mishap, blue for a serious one, and black for a minor injury. According to this record practically all of the serious accidents take place in the busiest thoroughfares.

CHEMISTS TRY TO MAKE GOLD BY BREAKING UP ATOMS

Granted the possibility of producing a current of a million volts, scientists of a government bureau feel that it would be possible to create gold and other metals by shooting electricity through atoms of the elements to be changed. Already experiments have indicated that by breaking down the atom, chemists are on the track of a method to transmute metals and perform other amazing services that may result in benefits of great value to the human race. The problem of battering down the tiny particles now depends largely upon discovery of the right force to direct into them, experts say. When this is solved some inventions of stupendous importance may follow. Possibilities are seen in the curative value of radium.

WARRIORS OF THE SEA NOW CHAINED TO DOCKS

Among the millions of dollars' worth of war machines built in frantic haste by the United States Government to combat the prowess of its foes during the war, are more than 100 warships of various types now lying idle in an eastern port. Chained to the docks, these warriors of the sea await the time when either they shall be put into service again, or dismantled under the terms of the disarmament convention. Stored closely together along the quays, they float idly on the quiet water, those which might be put into service denied the freedom of the ocean because there are not enough men attracted to service in the navy to form crews for them. Some are to be sold to the highest bidder, while others will be broken up because they are not modern, even though they might have been kept in service despite the treaty.



More than One Hundred Warships of Various Types Lying Idle in an Eastern Port: They Were Built by the Government During this Country's Participation in the Great War

BROOM HAS DETACHABLE FIBER FOR RENEWING WORN WISPS

Economy and serviceability are aided by a broom that is being made with a detachable handle to permit replacement of the fibers when they are worn down. This makes the buying of a new article unnecessary. Light in weight, it is balanced so that it can be used with little effort. It is said to sweep fine rugs without injury to them and to be equally effective on the sidewalk or porch. Designed to make house-cleaning easier, it is less tiring to the worker.

PAPER COMBS AFFORD PUBLIC SANITARY UTENSIL

For public places, such as hotels and barber shops, a paper comb has been offered, giving every patron a clean, sanitary article, which, when used once, may be thrown away. Since it is specially treated with a waxlike composition, it slips through the hair as easily as a comb of rubber or bone, and if it is cleaned it will not break easily. Tightly sealed in an "individual" package, it is protected from dirt until needed.

Individual Paper Comb to Promote Sanitation in Barber Shops, Hotels, and Like Establishments

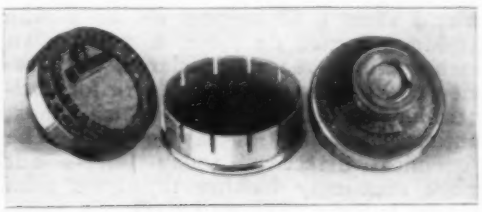
HIGH-SPEED MOTION BECOMES SLOW FOR CRITIC'S EYE

Making machines appear to stand still or move slowly while actually running at high speed, an instrument has been invented for studying the action of moving bodies. Intended to eliminate the risk of guesswork in designing, the device permits the observer to see clearly movements that might appear blurred, when viewed with the naked eye. Errors in timing of parts, speed variations, and other important details of working machinery can be discovered through its lens, it is said. The invention is also being used by salesmen of automatic tools to demonstrate their abilities in actual service, without need of lengthy explanations.

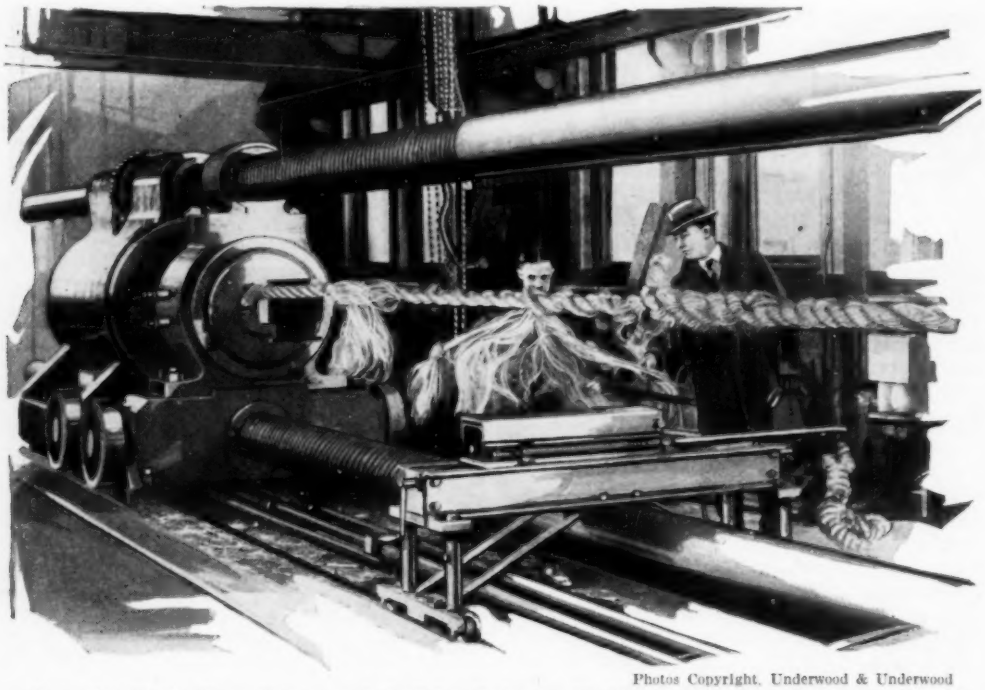
Observing Working Machinery through Instrument that Reduces High Speed to Slow Motion for Eye

POCKET DATE STAMP CHANGED BY TURN OF HANDLE

So compact that it will slip into the pocket, a date stamp has been patented that carries its own ink pad. Numbers are placed about the rim, indicating the day, and a turn of the handle sets a small pointer opposite the one desired. The month is indicated by rubber type in the center. Also there is room for any advertising desired.



Pocket Date Stamp, Carrying Own Ink Pad, Changed by Turn of Handle



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Inspecting Manila Hemp Hawser as It Is Being Broken by Machine Capable of 2,000,000-Pound "Pull"

"Chemical Detectives" on the Case

Industries, Faced by Loss or Ruin, Find Sleuths of Science Aids in Solving Baffling Problems

SPECULATION as to what the world of a hundred or a thousand years from today will be, continues to engage the minds of the nation's leaders in business and in science. Some of these prophecies are seemingly extravagant, but an inquiry into the extent to which science has penetrated business, serves to open a volume of real romance.

"The man who puts into words some of the things he believes chemistry will do, would seem a fit subject for an insane asylum," Irenee du Pont, a well-known manufacturer, recently declared, and a review of what the chemist is doing for business lends a firm ground on which almost unlimited possibilities may be faced. The "chemical detective" today ferrets out more seemingly baffling mysteries than Sherlock Holmes cleared up in his palmiest days.

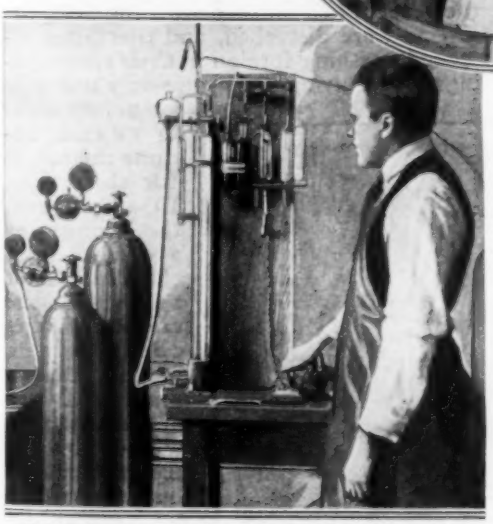
A certain large corporation in a western metropolis found that every Thursday, about 10 o'clock in the morning, their telephone switchboard, having some fifty connecting lines, went out of business. No one could reach the plant by phone, nor could the employes obtain outside lines. The telephone company was repeatedly called in, and although the equipment was entirely replaced three times, the trouble continued. Finally, an appeal was made to the chemical detective. After a few days' investigation he found that the contact points in the switchboard became coated each Thursday with a fine dust, which interrupted the electrical current. Analyzing the dust, it was found to be particles of burned paper. The chemist learned that, because of the heat of the summer, the windows in the room in which the switchboard was located were left open during the day. Investigating further, it was disclosed that the janitor of the building burned the week's collection of waste paper on Thursday morning at 9:30 o'clock. It was a simple matter to deduce that the fine ashes of burned paper, escaping from the chimney, were blown in through the windows and found their

way into the switchboard cabinet. As carbon is a conductor of electricity the ashes had short-circuited the electrical contacts. Thus, by simply closing the windows for an hour or so on that one day each week, the trouble was ended.

Deciding to add two stories to his building for the accommodation of his growing business, a macaroni manufacturer installed more machinery on the top one of the new floors. Thereafter, for weeks, he suffered losses, because the product turned out by the new equipment did not equal the goods that had gained him his reputation. Although he even went to the extent of exchanging it with the old machinery, no improvement resulted. After trying every means he and his advisers could think of, without success, he called in the chemists. They found that the air on the higher floor contained a different degree of moisture from that circulating on the lower floors. As a result, the dough could not be prepared satisfactorily. The fault was remedied and thereafter the trouble ceased.

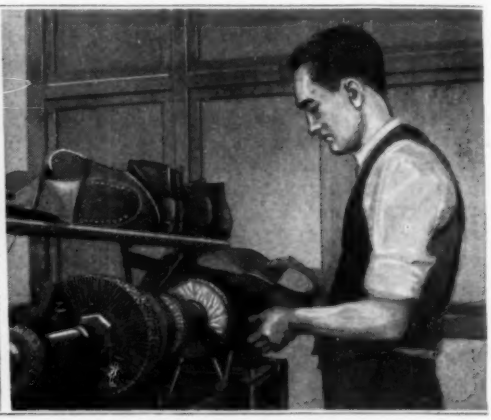
The owners of a factory, making bearings and tools, found a great many shipments being returned because of peculiar stains appearing on their products. Steel experts were put on the matter and could find nothing wrong with the grade of metals used. A rigid inspection disclosed no faults existing in the tools when they left the factory. However, the industrial chemist who was summoned, found that the tools were wrapped in paraffin paper for shipment to protect them against moisture. He also knew that sulphur and acid combined in the paraffin developed a solution that spotted the steel. The remedy was apparent.

Somewhat similar is the case of a manufacturer of tennis shoes who faced ruin when his product began to be returned in large numbers by his customers. The retail merchants pointed out that the white canvas tops turned black or became streaked, after the shoes had been on their shelves a short while. A score of attempted remedies failed to correct the defect and a chemist was finally called on the case. He found that the sulphur used in curing the rubber of which the soles were made, caused the stains, when it came into contact with another substance mixed in the



Top: Testing Drinking Cups; Center: Examining Air from Cement Factory; Below: Testing Compressed Gas

Planting Typhoid Germs in Test Tubes Used to Develop Vaccine



Testing United States Army Shoes at Bureau of Standards

white dressing that was used on the canvas.

Water for the boilers of a small-town factory had been obtained from a near-by well. Business prospered so that the owner was forced to enlarge his plant, which meant the addition of more boilers to the equipment. He then found it necessary to deepen the well in order to obtain sufficient water for them. Soon thereafter he began to have trouble. The boilers became coated on the inside. After some months spent in vainly trying to solve the problem, his friends persuaded him to call in a chemist. The latter found that in enlarging the well, the borers had broken through rock into deeper strata. The water from this level contained a mineral which formed a crust on metal surfaces under intense heat.

The matter of water has so engaged the attention of manufacturers that paper makers find it profitable to send samples of it from the proposed sites of new mills to laboratories for analysis. Frequently, such water has been found to be injurious to the product that it was proposed be made, and thus many a dollar has been saved.

A large corporation in the middle West made and sold reaping machines, which, among other things, tied a piece of twine around a sheaf of grain. Soon after the device was put on the market, farmers from Texas to Minnesota complained that during the night, after a field of wheat had been cut, the strings broke, allowing the sheaves to be blown apart. Investigators were sent out by the company to look into all such reports. They learned that the string apparently had been cut in each case and had not really broken. The chemical detectives were put to work and found that crickets were gnawing the cords apart. Further observation showed, according to one report, that the crickets did not like to eat the twine, and according to another, they did. Following out the first statement, it was asserted that when the reapers had finished with the field, the insects were disturbed, and thereafter attacked anything foreign in their surroundings. The string, being the only unfamiliar object within reach, became the target for their rage. In any event, the twine was soaked in a chemical that repelled the crickets and the complaints ceased. These are but a few of the instances where chemistry has ferreted out solutions to perplexing problems that have faced industry.

Studying Various Gases in Order to Learn How Best to Use a Furnace

GOVERNMENT ASKED TO RETURN BOOTY OF ANCIENT PIRATES

Swept from the high seas long ago, bold pirates and plundering privateers of the eighteenth century are once again recalled in long-standing damage claims which now are being pressed against the government by various individuals. These interests seek enactment of a law that will restore to them wealth that was taken from their ancestors, who in the days of the "Jolly Roger," were owners of ships that were looted by highwaymen of the trackless ocean. Listed among the claimants, in addition to members of prominent families of Philadelphia, New York, and New England, are certain insurance companies, and one eastern city. A measure, known as the "French Spoliation Claim," authorizing payment for losses of ships and cargoes between 1793 and 1800 at the hands of French privateers, has been reviewed by Congress. The demands are made against the United States rather than the French government because of certain early agreements between the two countries. After a long delay, the whole subject was referred to the U. S. Court of Claims in 1885, and since then, several suits amounting to nearly $4,000,000 have been settled. An attempt is being made now to dispose of the last of those favorably considered, involving $3,246,888.

¶Although carrier pigeons normally fly at the rate of about 30 to 36 miles an hour, they sometimes attain a speed of 60 miles an hour or more when "homing."

ANCIENT VOLUME THAT TAUGHT BOOKKEEPING WORK OF MONK

What is believed to be the first textbook on the methods of bookkeeping, has been presented to the library of a western

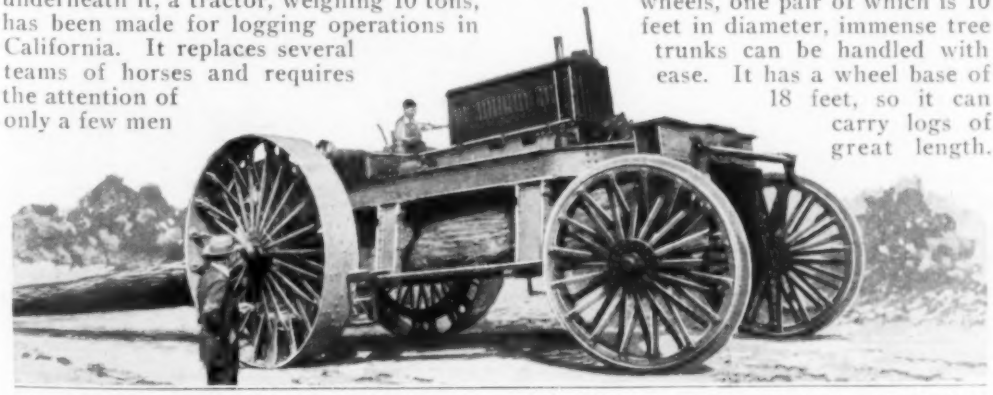
Volume, Almost Five Centuries Old, in which Italian Monk Explained Bookkeeping Methods

university. It is printed in Italian and Latin and was published in 1494. The author, Luca Paciloi, an Italian monk, is supposed to have originated in this work many of the familiar mathematical signs, such as "plus" and "minus" marks. The volume is still in good condition and can be easily read. The letters stand out sharp and clear, and the ink shows few signs of fading. The leaves are intact and the binding in good condition despite the volume's age.

TRACTOR SO LARGE AUTO CAN PASS UNDER IT

So large that an automobile can pass underneath it, a tractor, weighing 10 tons, has been made for logging operations in California. It replaces several teams of horses and requires the attention of only a few men

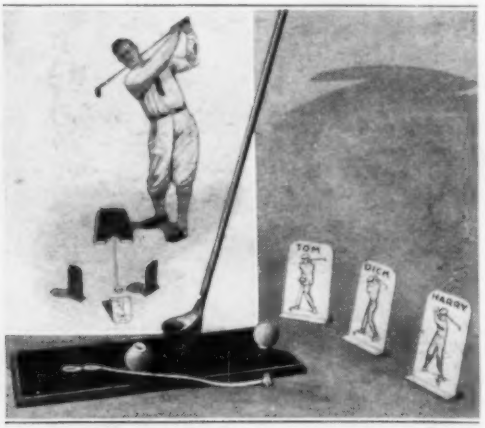
Slung beneath the body and between its wheels, one pair of which is 10 feet in diameter, immense tree trunks can be handled with ease. It has a wheel base of 18 feet, so it can carry logs of great length.



Mammoth Tractor Built for Logging Operations, so Huge that Automobile Can Pass between Its Wheels, One Pair of which Is 10 Feet in Diameter

INDOOR GOLF TEE TO HELP IN PERFECTING STROKE

Wherever there is space to swing a club, a golf tee for home and indoor practice, which has been invented recently, can be



Indoor Golf Tee with Elastic Cord to Hold Ball that Indicates Accuracy of Drives

used by players who want to preserve their "swing," or improve without visiting a course. The ball is attached to a rubber driving platform and re-tees itself after each drive. Shots may be aimed at tin figures set between two and four feet away, the direction of the pellet's flight indicating the degree of accuracy in the stroke.

SKUNK IS FRIEND OF FARMER, NOT HEN-ROOST ROBBER

Next to the muskrat, the skunk is now the most important fur-bearing animal in the United States. In 1858, only 18,255 pelts of this little animal were sent to market. Then the supply began to increase until the record number of 1,921,000 pelts was gathered in 1914. Occasionally, the average price was as high as $12, but in 1922, the top figure was $5.90. Commercially considered, according to government figures, the skins of skunks mean a total business of about $3,000,000 a year in this country. Experts of the agriculture department declared that the skunk is the most maligned of all dumb creatures; that, in fact, it is the most gentle, the most harmless, and most easily domesticated of all wild things that harbor on the fringe of farm lands. It is not true, according to the statement, that they kill chickens, steal eggs, or bother with any of the live things on a farm. Grasshoppers and crickets form a large percentage of their diet.

CASCADES OF FIRE PLUNGE HALF MILE TO VALLEY

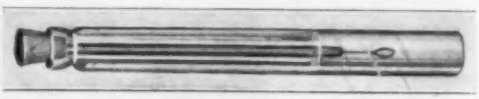
As part of a nightly program of entertainment, a western resort has a cascade of fire passing over a high ledge in the mountains and dropping almost a half mile to the stony floor of the valley below. At the top of the lofty point lives a man whose duty for some years has been the building of the "fiery falls." About dusk each evening he lights a huge bonfire of logs. After they have burned to a pile of glowing embers, they are pushed over the edge of the rocky wall with a long metal scoop, to drop in a spectacular, blazing avalanche that can be seen by the resort's guests several miles away.

SHIP ROCKED BY EARTHQUAKES WHILE IN MID-ATLANTIC

Sailing in mid-Atlantic, a vessel bound from Halifax to England recently felt four severe earthquake shocks, the longest of which was of 30 seconds duration. Each caused the ship to tremble from stem to stern. When the first came, the captain thought the ship had run afoul of submerged wreckage and was on the point of stopping the engines as the second occurred. It was even more violent. North of the craft's location at that time, the skipper reported, three peaks rose up from the bed of the ocean. Soundings indicated that the sea floor surrounding them was from 1,300 to 2,200 fathoms below the surface. In the opinion of experts, these mountains may have been in volcanic activity.

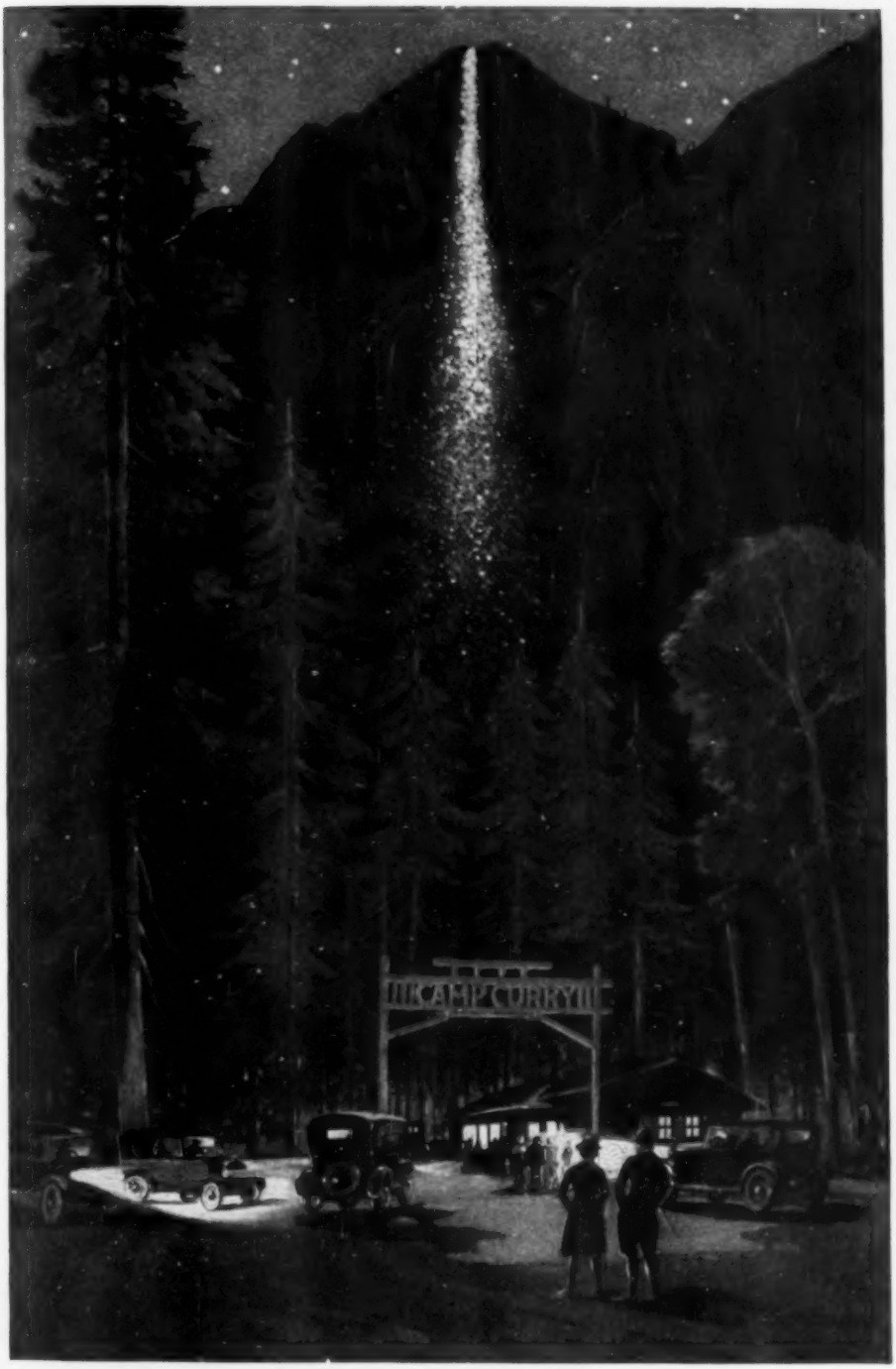
CINDER IN EYE EXTRACTED BY MAGNETIC LOOP

To extract cinders or other foreign particles from the eye, without risk of causing infection, is the purpose of a pocket in-



Instrument that Removes Cinders from the Eyes, and which Is Magnetized to Extract Metal Particles

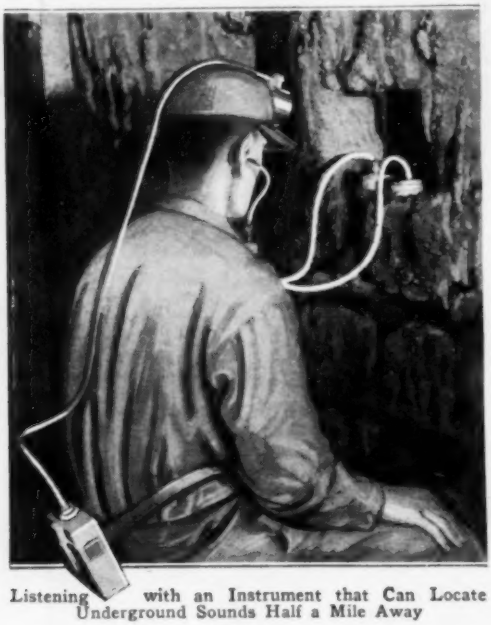
strument with a small wire loop, recently marketed. It is magnetized so it can easily remove a metal chip that may become lodged in the tissues. To keep sanitary, it fits into a tiny glass vial containing a sterilizing liquid. Many railroad men, motorists, and mechanics find this simple invention of great service.



Cascade of Fire Seen by Guests of Western Resort: Like a Shimmering Ribbon of Red against the Black Wall of the Mountain, It Falls to the Valley Far Below

DANGER FROM MINE BLASTING REDUCED BY SOUND TRACER

For preventing accidents from mine and tunnel blasting, a delicate listening instrument called the geophone, is reported to be proving of important service. With this device, which, it is said, is modeled after those used during the war to detect the presence of underground operations, sounds so faint that the listener has a sensation more of feeling them than of hearing, can be detected and identified. With a type now used to increase safety in mining, talking has been heard through 125 feet of solid earth and rock, and the hammering of a sledge underground has been heard 3,000 feet. Vibrations in the earth, set up by pounding, digging, or talking, alternately compress and rarefy air in the chamber of the instrument, and the sound is carried through a tube to the receiver.



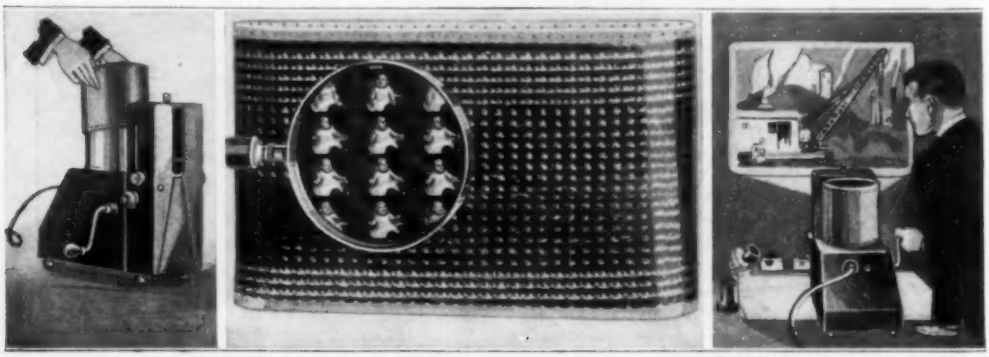
Listening with an Instrument that Can Locate Underground Sounds Half a Mile Away

DIAMOND FIELDS OF ARKANSAS YIELD MANY FINE STONES

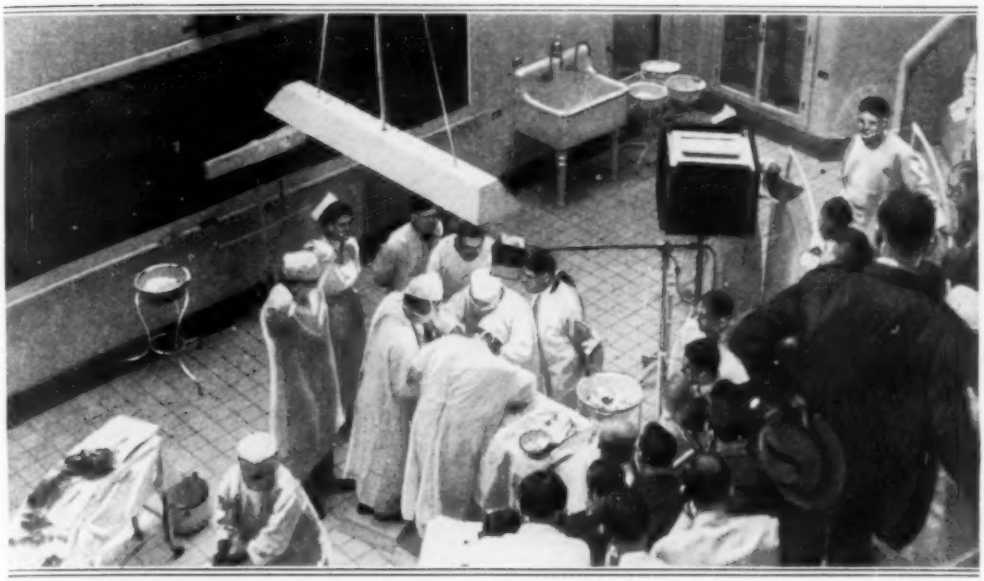
Nearly 6,000 diamonds have been found in the Arkansas fields, the biggest weighing 21.25 carats. Many of them, according to experts, are as good as those mined in any part of the world. In describing some of the brown, yellow, and white jewels from this state, experts have stated that they are absolutely perfect. A few of them, it is said, have been sold for as much as $600 a carat, but most of them are uncut and have been placed in private and museum collections. The first field was discovered by a farmer, whose mule kicked up a stone of unusual brilliancy.

TUBULAR FILMS BRING MOVIES TO HOME

To bring motion pictures into the home, a camera and projector are being made that use tubular films costing a little more than the average "still" photograph. One strip, which is of noninflammable film, will carry 1,664 pictures. The camera may be loaded in daylight. One reel equals 150 feet of standard film, and can be purchased for 75 cents. In projecting, rewinding and threading of the reels have been eliminated. The device may be attached to any electric-light socket. The camera is made of aluminum and differs little from the ordinary apparatus. The lens is always in focus, making it easy for the amateur to "shoot" pictures.



Tubular Film that Takes Motion Pictures for Reproduction in Homes and Offices: Left, Inserting Reel in Machine, and Right, Showing an Industrial Subject in an Office



Surgeon Performing an Operation without Resorting to Usual Anesthetic: Although the Patient Was Entirely Conscious and Could Watch the Doctor Working, He Did not Feel Pain

SURGEON WORKS ON PATIENT WHO WATCHES OPERATION

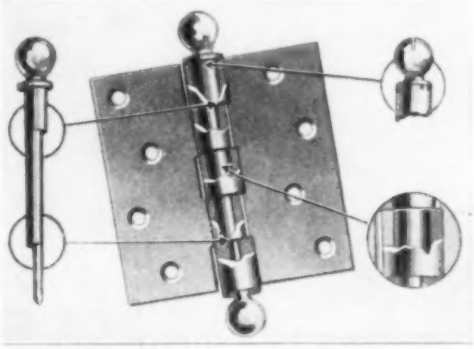
Without using a general anesthetic, a noted Vienna surgeon deadens the nerves of the body surrounding the point of operation, leaving the patient entirely conscious. In Chicago, recently, he performed a major operation on a man 52 years old, while the patient still retained his senses and could see the doctor at work. With only the nerves of the solar plexus treated, a gastric ulcer was removed from the stomach. Many prominent physicians who were present pronounced the feat remarkable.

AIR BLOWER ON DIESEL MOTOR INCREASES POWER

For increasing the power of normal four-cycle Diesel motors, a special air compressor has been devised in Europe that adds 30 per cent in working capacity and four per cent in over-all efficiency without straining the engines. With this device the weight of air that enters the cylinders in advance of the fuel is considerably increased, so that the engines are capable of consuming a greater quantity of oil. No part of the engine is said to be stressed any more than under ordinary conditions, for the maximum pressure remains almost the same. The burned gases are said to be completely removed from the cylinders more thoroughly, resulting in better combustion and with less impurities in the exhaust valves and other units. The perfection of this apparatus, according to engineers, indicates that there are possibilities of further improvements.

ADJUSTABLE HINGE FOR DOORS TO STOP RATTLE AND JAMMING

Rattling of a door by wind or sticking of the jamb from dampness is stopped by turning the center pin in a recently patented hinge, it is said. This action loosens



Adjustable Hinge that Is Said to End Door Rattling or Jamming with Turn of Center Pin

or tightens the door in the frame and quickly changes clearances, when weather causes wood to expand or contract, or when a building sags a trifle.

Glories of Mankind Told in Art-Glass Windows

Artist Adding Finishing Touches to Painting which Is to Be Reproduced in Exact Colors on Glass

OF all conveniences met with in everyday life, glass is one of most ancient in origin. Authorities differ regarding its beginning, but it is said to have been made by the Egyptians almost 8,000 years ago. And the coloring of it can be traced as far back as the remote eras of Chinese civilization.

Colored glass was first employed to make imitations of the brightly hued gems, such as rubies, sapphires, and emeralds with which the ancient nobles decked themselves and their horses in barbaric splendor. It was not until demand for the material to be used in flat subjects was born that it was rolled into sheets.

One of the first steps in this art of painting in glass, which enshrined and glorified national, religious, and romantic characters in churches and universities of the Middle Ages, was the discovery that under action of fire a solution of silver would stain a clear glass yellow. This find marked a beginning of stained glasswork. Nobility, clergy, and artists became enthusiastic over it. It brought to the seat of learning and culture the master glassworkers of the world, persuaded by the rich fields that these places offered for their services. Money was raised on all sides by public-spirited persons, and studios furnished to these artists, who set about to ornament the classic pages of history with skill, the results of which are still to be seen among the architectural beauties of the Old World.

The early artists began by producing borders and scrolls, simple things compared to their later achievements. But soon some courageous adventurer in color craft inserted a slight peep of a country landscape into a corner of his subject. At first, the wise ones wagged their knowing heads and pronounced it foolhardy to attempt to do that with glass, which they had been taught the brush alone could accomplish. But later another invaded the outer world for an inspiration, and when he had finished his task his patrons beheld a daintily wrought human figure, done with tinges of color, that set them to clamoring for more of the same.

Thus it was that medallion windows came into vogue, and these were followed by ornate canopied patterns and massed groups of pictured men and women, which cover the spreading walls of many of the Gothic structures left to the modern world by builders of old Europe.

Time and again the hand of disaster laid upon the work. Wars, and invasions they caused, halted the progress of the art, which was just as often revived. As architecture developed, it began to take account of the new ornament, and structures were planned with a view

Pasting the Paper Patterns to the Surface of Clear Glass before It Is Cut

Like the Cathedrals of the Middle Ages the Modern Church Employs the Artistic Utility of Stained Glass to Depict Scenes and Characters that Relate to Its History

Above: Fitting in the Glass Fragments on the Paper Guide. Below: Burning the Colors in Under Intense Heat

Above: Applying Cement Dressing for Waterproofing Window

Left: Uniting the Glass Segments with Soldering Metal

to admitting the art window into their designs. Thus greater demand was put upon the creators of these fantastic affairs. Vying with one another, they spurred to higher aims. Masterpieces resulted, and fresher subjects were wrought into the windows. Many of the creators of these failed to leave any certain identification, and a number of the finest specimens which delight present-day tourists in the Old World, bear no marks by which their modelers can be credited.

Each set of artists had their own style. As these impressed those who could afford to have such marks of luxury to distinguish them and their houses, importations of foreign craftsmen became the practice. Spaniard and Italian invaded France, seeking a market for their services, and in turn the Frenchman passed with his art into other countries.

Often, to the leaders among them, entire windows were given over by their owners for the illustration of some heraldic figure set in imitation of a noble who generally desired to be remembered in this way by those destined to take over his house and his lands after his demise.

Many of the faces of the earlier figures that entered into these patterns were distorted, owing to the inability of the designer to produce in glass and colors with equal detail, what he could set down on canvas. They frequently were incorrectly posed and assumed grotesque positions, vastly unlike the original drawings that first appeared on paper. Other figures were not properly proportioned.

As in the olden times, the present-day artist in stained glass first paints the picture he is to reproduce on paper or canvas. From this original a pattern is made of the same material with the shapes of the inlays drawn to their exact sizes. Double-lipped shears then trim a narrow strip along each line, separating the sections as they are to be after the lead or zinc joints are in place. Glass of the required shades is then selected and cut into bits of the shapes and sizes of the paper pieces.

After they are put in place on a skeleton easel, they undergo a sort of critical test as to arrangement of ground color, lights, and shadows. This test is always made against a northern light, since an even blend of the sun's rays is available from that direction.

Though the opening chapter of the history of stained glass seems to have taken place some time in the Middle Ages, when colored windows were made as a kind of story-book picture, few changes have since been adopted. Steel tools have replaced diamonds for cutting, and zinc occasionally is used instead of lead for joints. The invention of the double-lipped shears used in cutting the patterns out of paper is said to be the only other new implement in an industry that was old long before America was discovered.

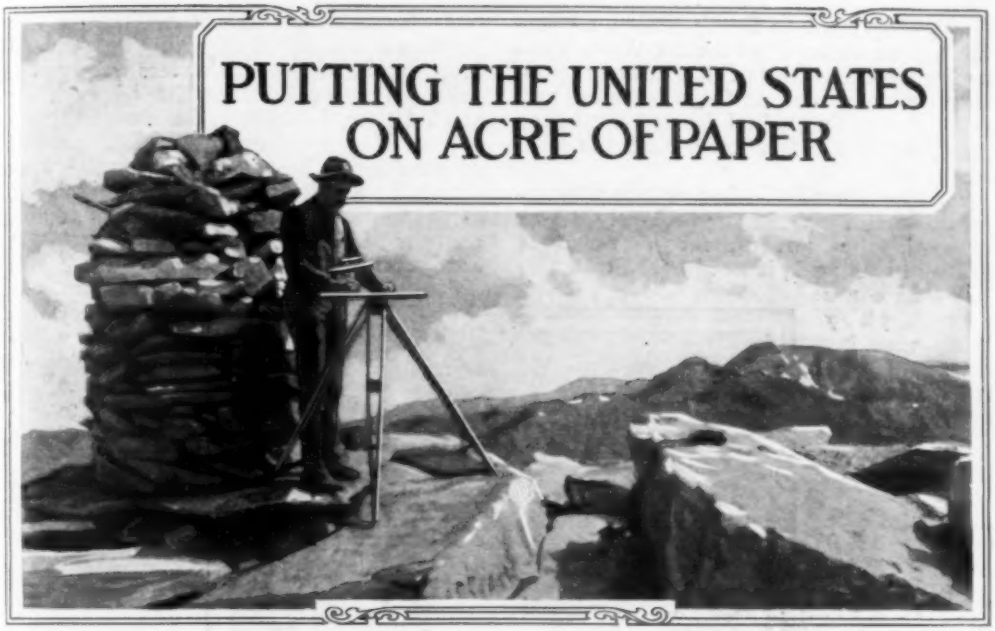
Design of Window Cut from Cardboard with Painting Underneath It

HIDDEN WORLD'S LIFE SHOWN WITH MAGIC LANTERNS

For screening microscopic slides of plant stems, flowers, and insects with the ordinary magic lantern, such as is used in elementary schools, a magnifying attachment is being made. With this device, pictures of living things of the "unseen world," so minute as to be invisible to the unaided eye, are thrown on a curtain with accuracy and clearness. The lens, easily adjusted, produces enlargements 60 times the size of the subject at 10 feet, 120 at 20 feet, and 180 at 30 feet. Held rigidly in place by a screw, the apparatus can be removed when the ordinary type of work is desired.

From Snow-Clad Mountain Peaks, High above the Clouds, to Hot Desert Sands, Uncle Sam's Map-Makers Risk Lives to Put the Nation on Paper

PUTTING THE UNITED STATES ON ACRE OF PAPER



SHOWING every "bump and dent" in the land surface of the United States, the largest and finest picture map of its kind in the world is in the making in Washington at a cost estimated at 100 million dollars.

It is being made piecemeal style on an extraordinarily large scale, one mile of the natural lay of the land being represented by one inch of map surface. All the integral parts of the map dovetail together like the tiles of a mosaic. One of the maps can be carried in the vest pocket, yet, if spread out and pieced together, the geographical picture of our country would cover more than an acre of ground.

The national map-makers ascend all the mountains and towering crags in the country, brave the heat of the southwestern deserts and the penetrating cold of Alaska, and perform "dare-devil" stunts close to the clouds or away below sea level as their regular daily routine. Their lives are filled with adventure and romance such as the colonial pioneers, the early California gold seekers, and other settlers of the great American wilderness of a century ago experienced.

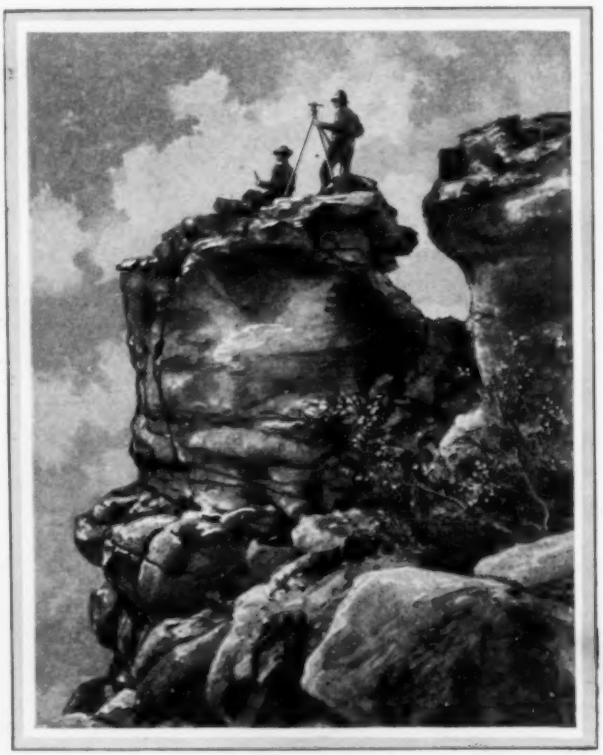
Four hundred of the most expert topographical engineers in America with their assistants, rodmen, camp attendants, and cooks take the field from their Washington headquarters as soon as the songs of the first spring birds are heard in the latitude of our national capital. These federal scientists scatter to every section of the country, where the mapping activities are in progress. They remain afield until the appearance of Jack Frost and his colleagues—ice and snow—which prevent further mapping operations. They then return to Washington, where the winter months are spent in inking in and perfecting their pencil-sketched field maps, and in supervising the engraving of everasting copper records of the scientific data.

Other surveying parties, which aggregate 100 topographers and their aids, are gaining complete familiarity with every square inch of land surface in Alaska. Often, these scientific scouts of the Northland work for months at a time, 300 to 400 miles from the nearest white man's habitation. The clothes which they wear in the frosty summer are made of fur, for in the interior of Alaska, even during the season when everyone is sweltering in Chicago and New York, the mercury hovers around the zero mark.

Just to illustrate how the hazards of mapping in moderate climes are almost as dangerous as those experienced in Alaska, mention of the marvels encountered in the course of a 90-mile stretch of country in California is worth while. From the sky-high summit of Mt. Whitney, 14,501 feet above the ocean level, the experts laboriously wormed their way to safety in a risky descent. Mile by mile, they continued their painstaking survey of every hill and hollow that lay in their path until

finally they came to Death Valley, a notable "no-man's land" of the far West. Venturing the difficulties of that famed region, the map-makers began to go down hill and continued their gradual descent until they finally stood 276 feet lower than the level of the sea.

Irrespective of whether or not a mammoth mountain has previously been climbed, the government map-makers ascend to its peak, if need be. From this perilous perch, they study the lay of all the surrounding land and transfer its features to paper, using pencils with the hardest lead obtainable to make these technical sketches. Prowling predatory animals, such as grizzly bears, wolves, and coyotes, mean nothing to them. They boldly invade the secret lairs of man-killers in search of their land bump-and-dent data. They work on the Arizona desert where the heat of the sun is terrific. Along the northern border of the United States, they pursue their novel occupation under as trying temperature conditions, the mercury often standing 10 to 40 degrees below zero.



Burdened by Heavy Instruments, Scientists Struggle to the Top of Mount Whitney, Thousands of Feet above the Sea Level

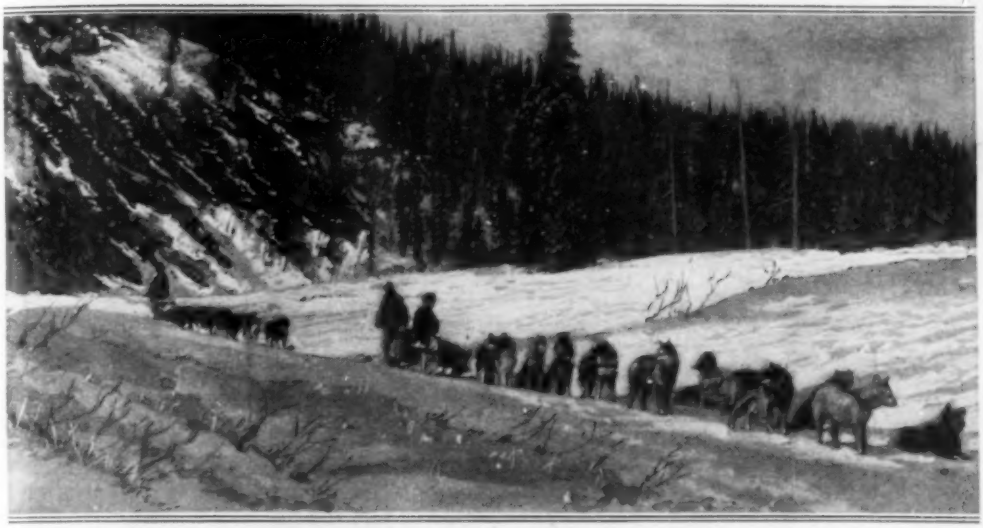
Most of the mapping work connected with the gathering of facts and figures for putting the United States on paper is, of necessity, performed on foot. Lately, however, airships have been recruited for the novel task. Flying at altitudes of about 8,000 feet, the national birdmen, by the use of specially contrived cameras, photograph the land as it streams by in panorama below. Subsequently, these films are pasted together to form a complete picture of the area as it is taken through the lens.

Approximately three centuries ago, the curious business of mapping the United States and its boundary waters was begun. John Smith, a prominent English explorer at th t time, inaugurated a mapping survey of Chesapeake Bay. After several months' work, however, his attention was diverted to other activities. Thereafter, little was done in reducing the shape and contour of the New World to parchment until after the Civil War, when Uncle Sam began to explore every hilltop and valley from Canada to Mexico, between the Atlantic and Pacific oceans.

After four decades of painstaking work, less than one-half of continental United States has been accurately charted. Unless the mapping campaign is speeded up it will take another century of constant labor to complete the herculean task.

A topographic map is a veritable crossing and crisscrossing of intersecting lines. These scientific networks are of the greatest importance to transcontinental railroad engineers and to all agencies interested in mining, commercial engineering and industry. They portray the shapes and contours of the countryside and constitute a complete dictionary of altitudes for all named and unnamed places in the ntire nation.

In this great enterprise of producing a picture of the nation, the country is divided into unit areas or quadrangles, each of which is 225 miles square. Uncle Sam pays between $3,000 and $8,000 for surveying and mapping each of these portions, depending on its ruggedness of topography and degree of settlement. As each quad-



Dog Teams Carrying Map-Makers through Uncharted Wilds of Alaska, where They Face Arctic Cold for Eight Months of the Year Before Returning to the States

rangle is mapped, the resultant scientific data reproduced in map form is sold for 10 cents a copy. If a similar map were prepared and distributed by a commercial agency, the price would be many times that amount.

Three thousand quadrangles, equivalent to approximately 675,000 square miles of land and water surface, have already been mapped. These fit together like a picture puzzle. In the leading mining sections of the country, the topographic maps are made on larger and more detailed scales than most of the other regions.

The federal topographer will survey and map about one square mile of land area daily, during his field work. In the small space of one square inch, he will set down every outstanding physical, natural, and artificial feature and landmark, by the finest of hairline drawing and lettering. Thereafter, each map is engraved and printed in three colors.

Never were any valuable documents of state or nation more carefully and zealously guarded than are these precious scraps of paper which the federal map men make.

Already both the army and navy have mapped large areas by this method. While in many cases the principal elevations and depressions are shown on the photo-map, the minor changes escape. Nevertheless when the ground is level, aerial photography often becomes an invaluable aid to the topographer.

Map-Makers' Pack Train on Way over Mountain

Signal Station Built on Mountain Top by Uncle Sam's Scientists: This Target May Be Seen for a Long Distance and Is of Great Aid in the Making of Maps

PLANTS REVEAL RICH ORES OVER WHICH THEY GROW

Plants that generally grow over certain mineral deposits aid miners of Australia in locating rich ore deposits. Where the calamine violet thrives, they look for a zinc called calamine, because the flower favors earth containing this substance. Iron is often indicated by a copse of birch trees, while bindweed suggests the presence of phosphate. Lead may be discovered where there is a poisonous plant of the sumach family, and limestone is revealed by beech trees.

PUSH BUTTONS ASSIST WHEEL FOR STEERING SHIP

Push buttons on the bridge of a ship are used to control a new type of rudder, which is intended to do away with much signaling between navigator and engineer, and to make docking easier. After a recent test, engineers predicted that the electric system may simplify handling of even the largest ocean liners. A row of buttons near the compass and an indicator dial

Pilot House with Electric Buttons and Indicator Dial to Steer Boat, Making Docking Easier

showing how to use them to regulate a motor in the stern, are used in steering. The motor moves the rudder.

¶Alaska has yielded gold worth 328 million dollars.

DUSTLESS ASH SIFTER SAVES FUEL, PREVENTS DIRT

By sifting unburnt coal from stove ashes, a device is being made in Europe to enable housewives to reduce the cost of

Ash Sifter which Saves Fuel and Operates without Permitting Dust to Escape

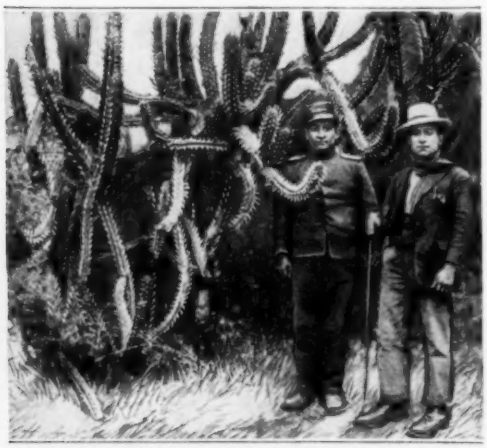
fuel. Tightly constructed, it prevents dust from escaping and may be used in any part of the house. Resembling an ice-cream freezer and operated by a crank, the machine quickly separates the waste material from that which may be unconsumed, the good particles remaining in its upper section, while the refuse drops into the lower part.

FORTY-THOUSAND-MILE FLIGHT GETS BEE POUND OF HONEY

Flights totaling more than 40,000 miles must be made by a bee to gather enough nectar from the flowers to make a pound of honey, experts have recently figured. Gathering the sweet liquid within a radius of two and a half miles from its hive, it is estimated that the little housekeeper travels at least one and one-half miles for each drop. It takes one-half gallon of this substance to make one pound of honey. At the same time, it is said, the busy worker also carries plant pollen and water with which the young brood is fed.

FIND CACTUS PLANT LIKE MASS OF SERPENTS

Found recently by museum workers in South America, a type of cactus new to science, presents an odd appearance. The leaves are long and thorny and resemble snakes more than they do parts of a plant. Scientists, who made the discovery, have been unable to determine any special service that the curious growth might perform, even in its native habitat.



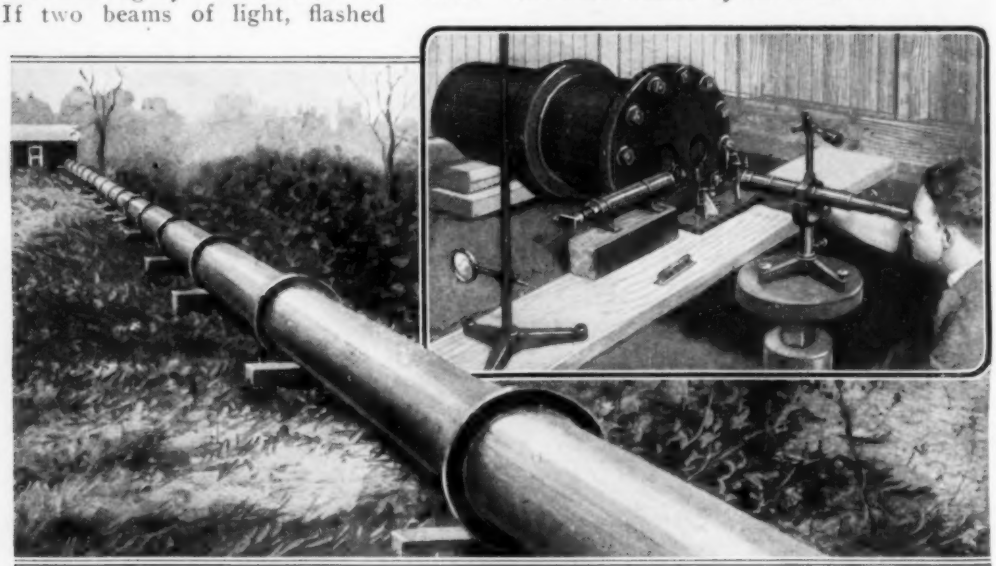
Odd-Looking Cactus of a Type New to Science that Was Found in South America

POROUS BRONZE BEARINGS HELP PROLONG LIFE OF AUTO

Absorbing oils and greases up to 25 per cent of its volume, a copper-tin bronze automobile bearing recently developed is expected to simplify the problems of lubrication and to aid in prolonging a car's life. Under a test, it was found of service in all ordinary uses and in many cases satisfactory for replacing ball and roller types. Thousands of tiny pores give the metal the qualities of a blotter or a wick. In a demonstration, a kerosene lamp was fitted with a bushing of this material, instead of a cotton wick, and burned as long as the liquid lasted.

PIPE A BLOCK LONG TESTS EINSTEIN THEORY

With a length of sewer pipe a block long, scientists are testing the Einstein theory of relativity. By observing whether light rays are bent in passing through a vacuum tube and being reflected by mirrors back to the source, they hope to solve the question as to whether air is stationary or is drawn along by the motion of the earth. If two beams of light, flashed from opposite directions in the tube, displace each other, it will mean that the theory is correct, say the experimenters. About 95 per cent of the air was withdrawn from the tile tube by a vacuum pump, and delicate instruments in little houses at both ends record the results of the trials studied by the observer.



For Testing the Einstein Theory of Relativity this Vacuum Chamber Was Built of Sewer Pipe. Above: Instrument to Aid Scientists in Study of Action of Light in Tube

AUTO AND HIGH-POWERED GUN ELIMINATE WILD ANIMALS

Modern firearms and automobiles, some scientists say, are responsible for the decrease of wild animals in all parts of the world. The disappearance of certain species which existed in great numbers a few years ago, recalls the fate of the dodo and the great auk. Persons advocating more protection and stricter hunting laws direct attention to the slaughter of the American bison, of which several millions are said to have been killed in the United States and Canada. Musk oxen that once roamed in large herds through the arctic regions, are nearly extinct, killed off by white hunters and Indians with high-powered rifles. Mountain sheep also have almost vanished.

PHONE TALK RECEIVED ON WAX ROLL REPEATED LATER

Telephone messages may be taken on a wax roll with a recent invention, reproduced when desired or held as records. When the business or professional man does not wish to be disturbed by phone calls or is absent from his office, he may connect the instrument with a recording machine. When ready to listen, he starts the cylinder revolving by pressing a button, and through the receivers in the headset, clearly hears everything that was said over the telephone. The rolls may be shaved to be used again or kept permanently as proof of statements.

Hearing Phone Calls Received on Wax Roll to be Repeated When Desired

¶The modern German stove would seem strange to the American housewife. Resembling a chiffonier or an ice chest, it has several drawers and burns lignite char, a peatlike substance. The stove is built along these lines for economy of heat. All cooking is done in the top compartment.

PIECE OF NEEDLEWORKER'S ART COMMANDS HIGH PRICE

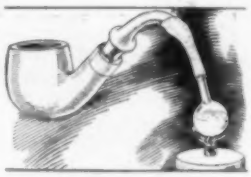
Patiently worked with needle and silken threads of varied colors, a single piece of embroidery recently exhibited in the East is valued at several thousand dollars.

Embroidery Whose Design and Skillful Needlework Puts Value at Several Thousands of Dollars

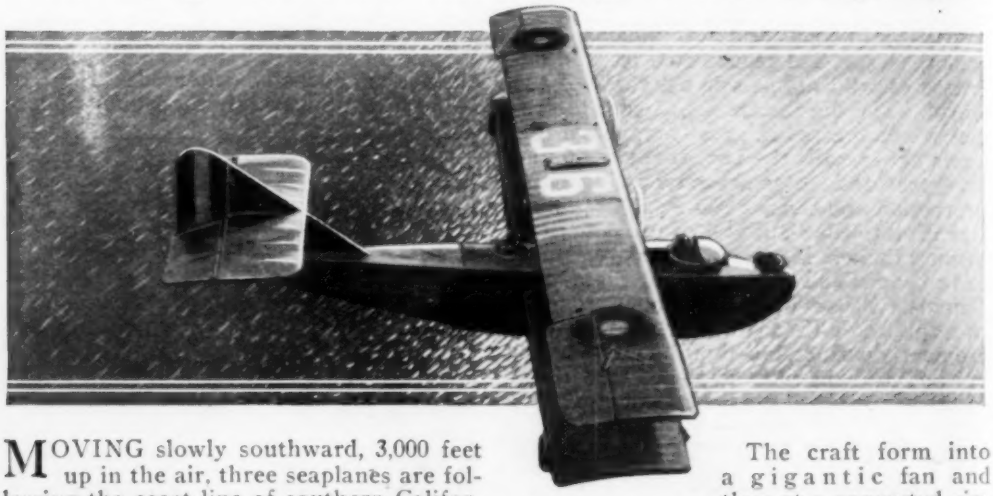
Against a background of white, a proud peacock struts, displaying his beautiful tail. Into this single example of the needleworker's art went many hours of patient and eye-straining toil, done with an artistic touch that rivals that of a painter. Embroidering is one of mankind's oldest arts, developed from almost prehistoric times. In the tombs of Egyptian Pharaohs who lived as early as 1600 B. C., skillfully embroidered linens have been found, preserved through the centuries by the dry atmosphere of the vaults.

STEAM CLEANER FOR PIPE STEM TAKES OUT IMPURITIES

Pipe stems and cigar holders are now being cleaned by a recent invention which creates steam from water or vapor from alcohol boiling in a small glass bottle. By holding the bulb over a flame, the vapor thus generated passes through a rubber tube from the container to the mouthpiece of the article to be cleansed, sterilizing the interior and forcing out all particles that may have lodged in the opening.



Tracking Fish of the Deep with Seaplanes



MOVING slowly southward, 3,000 feet up in the air, three seaplanes are following the coast line of southern California eight or ten miles out from shore. Suddenly the observer in one of them, peering through the floorless bottom of the cockpit, reaches over to a switch and a radio message crackles into the air. The plane swings into an elliptical course, two miles north and south and a half mile wide. The other planes continue in a straight course.

At North Island, one of the federal aviation stations on the Pacific coast, a wireless operator leans to a telephone and speaks clearly and slowly:

"Sardines, two by a half; one mile north-northwest Coronado Islands."

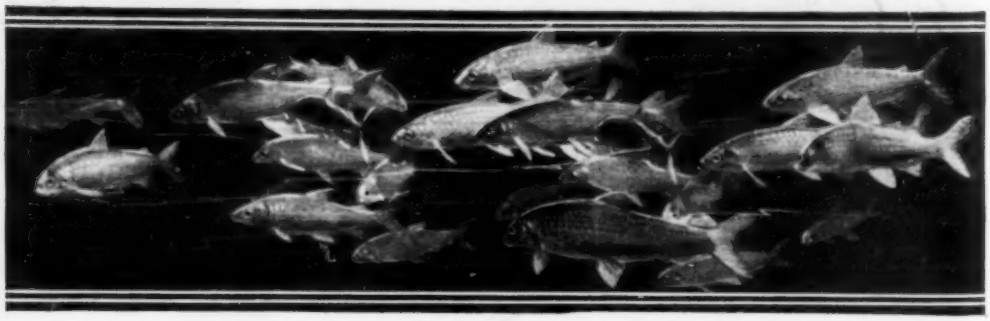
On the water front of San Diego, a minute later, a shrill whistle cuts the air and from 50 to 250 motorboats put to sea in battle formation. Toward the Coronados they drive, and nearing there a few minutes later, they sight a seaplane moving languidly above. A flag is run up the mast of the leading boat; the seaplane drops to almost water level and directs a course; the flotilla of boats follow, spreading out as they proceed to the point.

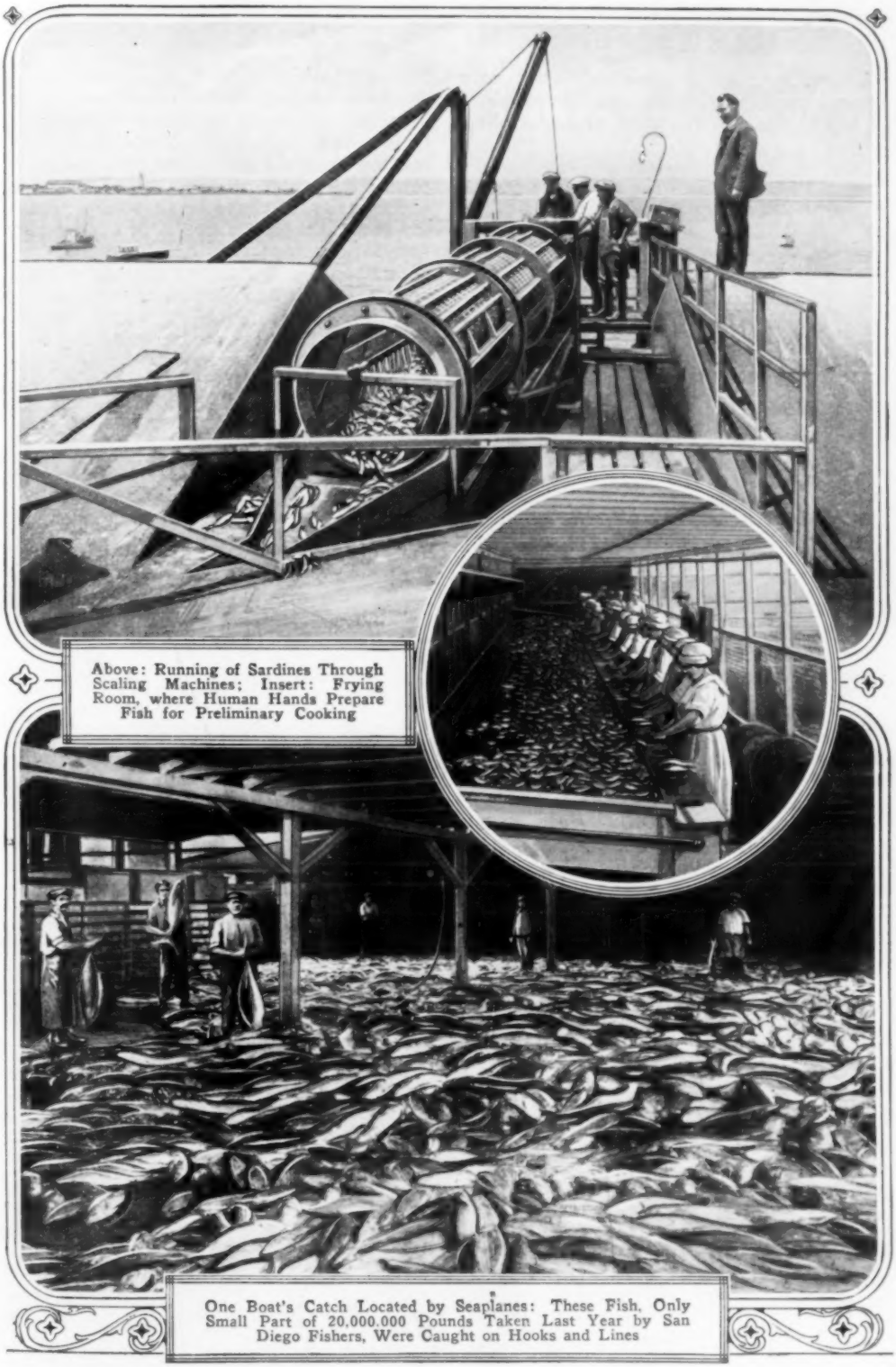
The craft form into a gigantic fan and then at a concerted signal throw their nets overboard and steer for a common center. They proceed spasmodically, stopping to haul in their nets laden with sardines and casting out again. The plane is no longer necessary and it rises to join its fellows.

As the boats reach their capacity and no more fish can be piled on the decks, they turn shoreward. Here, tied up, they shovel their cargoes onto the dock and await another message from the airship.

How effective this mode of fishing is may be judged from the increase of production of fisheries along the coast near San Diego since the planes have been used. Last year approximately 10,000 tons of fish were landed without the use of aircraft. This year it is believed that there will be a 20 to 25 per cent increase.

When the fish are running normally and in their usual seasons, the planes are not necessary, as the fishermen locate them by the flocks of gulls that follow them by day, and by the phosphorescence they give off at night. However, with these aids, "fishing by plane" is more productive.





Above: Running of Sardines Through Scaling Machines; Insert: Frying Room, where Human Hands Prepare Fish for Preliminary Cooking

One Boat's Catch Located by Seaplanes: These Fish, Only Small Part of 20,000,000 Pounds Taken Last Year by San Diego Fishers, Were Caught on Hooks and Lines

PERISCOPE AIDS GOLF PLAYERS TO SEE HIDDEN GREEN

Players on a golf course in Wales locate a hidden green by using a periscope. Attached to the side of a shed, and extending

Copyright, Underwood & Underwood

Golf Players Using Periscope to See Lay of the Land Before Driving Off

about fifteen feet in the air, the device affords an unobstructed view of the fairway. Before driving off the tee, each player looks through the lens to determine if the green is clear, thus avoiding the possibility of striking persons who may be near it. It also aids the golfers in directing "shots."

SCISSORS GET SHARP EDGES CUTTING METAL SHEETS

By cutting sheets of metal foil, now being sold in Europe, scissors are easily sharpened, good edges being obobtained with a few slashes. Knives also may be dressed by drawing them across the material while it lies on a flat surface in much the same manner that an oil stone is used.

SOIL OF ORIENT BECOMES BANK FOR SUSPICIOUS NATIVES

Vast amounts of buried treasure in the form of gold and silver coins and ornaments are lying in the soils of India, China, and the Malay Peninsula. The coolies, in years past, took this means of protecting their meager hoards against the rapacity of those in authority. Bankers place the total amount of capital thus withdrawn from circulation at hundreds of millions of dollars. Officials in India have attempted to persuade the common people to deposit their savings in the banks, but their efforts have not been entirely successful. The silver market of the world is greatly dependent on India and China for an outlet for a large share of the bullion.

BUNGALOW BUILT IN TREE TOP MAKES AIRY HOME

Built among the sawed-off branches at the top of a tree, but equipped with a roof garden and other luxuries, such as are found in modern homes, the abode of a Civil War veteran is one of the sights of a soldiers' home in California. Preferring the airy dwelling to one on the ground, he rented the structure and fitted up comfortable quarters. Two large rooms, a kitchenette, and a veranda reached by an outer stairway, compose the building.

Where Civil War Veteran Lives in Completely Appointed Bungalow Perched in Tree Top

Native Tells of Great Quake

From Popular Mechanics Magazine's Japanese Correspondent,
N. SAKATA OF TOKYO

[Popular Mechanics Magazine believes it need offer no apology for presenting an account of the Japanese earthquake at this late date, when it is the experience of a native eye-witness, N. Sakata, this magazine's special correspondent in Tokyo. The tale is a moving one and written from the native point of view. In the stress of his emotions, Mr. Sakata seems to have suddenly developed a fluency in English, which former contributions lacked to some extent. His "copy" has been edited in order that his pitiful adventures may be more readily grasped by the reader.—Editor's Note.]

THE morning of September first was stormy. A strong wind was blowing, and I could scarcely hold an umbrella. It was raining heavily, but when I reached my office it began to clear up, and the dark sky changed to a cheerful blue.

At 11:58 o'clock I heard a strange sound from the earth through the building wall, but since it was so slight, and, because I afterwards learned that other men did not notice it, I paid little attention. Soon afterwards, the building began to shake very softly. Inasmuch as we Japanese are familiar with small earthquakes, I paid little attention to it and felt that it would soon pass, but, alas! it grew into an uncomfortable shock.

I heard the crying of women and the sounds of the cracking of the adjacent building walls. We had in our room a large case for filing papers which measured about 10 feet high and 20 feet wide. This now began to sway from left to right, and back. Finally, it fell over forward. The bookcase crashed to the floor and my writing cabinet fell over. The huge body of the office building was still shaking, giving off an indescribable sound.

The movement of the first shock still continued, and I cannot tell you how dreadful it was to me. The walls had not cracked in my room, but I could hear them from all sides. I supposed, of course, that my room would finally crush in, and in my mind I said farewell to all my brothers, my mother, and my sister. I crawled under the heavy desk, hoping that I might thus be saved.

After the first tremendous shock, I resolved to go to the Imperial Palace Square, which is a very wide field and near our building. As I rushed out the front door, I noticed that the huge buildings all about me were broken. A man,

terribly hurt, was sitting on the ground by the building. I ran on to the square.

Many fires now arose throughout the city. Black smoke and red flames were cast over the sky. I could not see the natural color of the sky anywhere because of the dense smoke. Hunger and thirst came next.

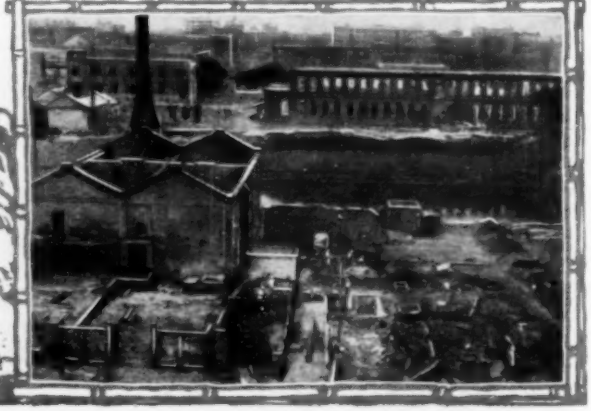
Indeed, the first night of the earthquake, September first, was a very dreadful one. I still find it difficult to believe that it is all true. In every direction one might look, the city was a mass of flames. The Imperial Palace Square was the middle of a great furnace. Crimson flames and billowing clouds of smoke covered the city.

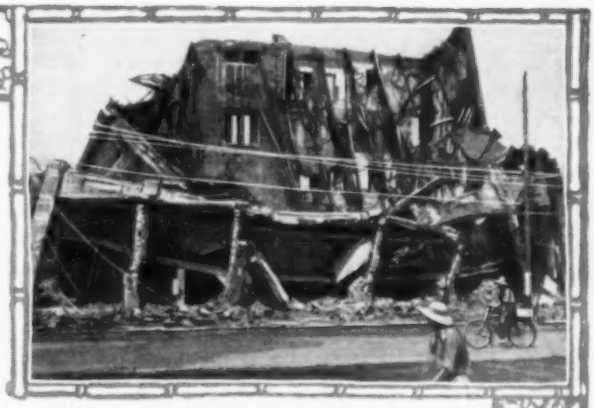
We could find no light or gas in the square, for these had been extinguished at the producing station because of the danger of fire. There was, however, no need of man-made illumination, for the holocaust provided as brilliant a light at night as the sun did in the daytime. The temperature of the air being raised, we were forced to breathe quickly, the heavy air almost stifling us. I could not sleep, for I was nearly frantic thinking about my mother and sister whom I had left at home.

Hunger attacked us. Tokyo is very cold in September, and although the flames gave off great heat, the midnight air chilled us.

I tried to get out of the crowds. There were more than 100,000 gathered in this small square, so it was very difficult to get away. Indeed, I could not get a bit of space to stand up. It took me 30 minutes of crawling and stumbling to move 200 feet, but finally I emerged.

After a very long time, and by devious routes, I reached my home. Alas! I found my house burned to ashes, and I could not find any members of my household. I searched and searched in the clouds of smoke for my mother and sister. The smoke





filled my eyes and I could not see. I tried to find even a bit of my mother's burned body, but I could not. After hours of vain search, my eyesight nearly gone from smoke, I had to stop, and I could only hope that my mother might have escaped to safety somewhere. I could not think of any place she might be. All the homes of my relatives were destroyed. "Oh, where could she be!" I asked myself, and cried and cried. I thought that I might not be able to find them anywhere any more in this world. All my courage had disappeared.

It was in this state that, as I was walking along the river which is near my house, I saw a woman dimly through the smoke—just an outline. The phantom shape seemed to resemble my mother. I approached and asked her who she was, and then, I could not believe it was real! I thought it must be a dream, but it was not. It was my mother! It was my mother! She and I embraced each other again and again, thanking God, and again I cried and cried for joy.

Coming home from my office I saw hundreds of dead bodies of men and women. I had had nothing to eat for more than three days, and the odd odor of the hot wind often caused me to fall down fainting. But my mother and sister were safe, so my courage had returned to me. Everywhere, I saw thousands of people running to escape from the city to the suburbs. I had taken my mother and sister to the suburbs, and was trying to get into the city. I understood fully that I might be wounded or killed by fire and falling buildings, but we nevertheless kept on our way.

Occasionally I was asked who I was by a policeman. They urged me to stay out of the city, and at times even attempted to prevent me, for by this time the government had declared the city under martial law, and soldiers stood on the road with their guns loaded and swords bared. If we insisted, then it would

mean we would be shot or cut down. Sometimes we were attacked by flames and smoke. Frequently, to protect ourselves against such terrors, we were forced to dash into the water and get ourselves wet from head to foot. It was very dangerous work. The fire continued eight days.

We Japanese have one thing in mind to tell you; that is, our great thanks for the wonderful help you gave us. If you will, please, print on your pages that the Japanese people are thanking the American people, and will never forget your kindness at this time.

I am now at Shibaura, which is the shipping center on Tokyo Bay. I can see many ships flying the American flag on the calm sea. It is an inspiring sight, and I thank God for it.

N. Sakata

ELECTRIC "VALET" FOR PRESSING TROUSERS IN HOME

For pressing trousers quickly and conveniently, an electrical device is being

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Device Operated by Electricity to Press Trousers Quickly and Conveniently in the Home

marketed that attaches to the ordinary light socket. There are two sections, the lower one, which is heated and over which the trousers are laid, and the upper, which is attached to the former by clamps. In pressing, one has only to fasten the two sections together and turn on the electricity. Within a few minutes, the garment is reshaped and ready to wear.

SHIPS PASS ABOVE LOFTY HILLS IN JOURNEY OVER SEAS

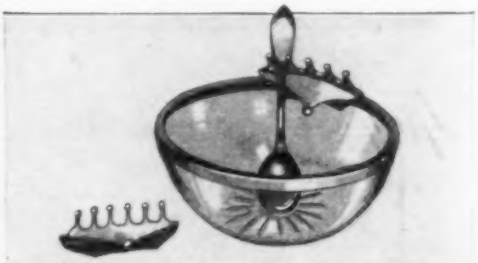
By means of a new method of surveying the floors of oceans, it has been possible to chart some of the deepest waters. These maps show that transocean steamer paths pass over mountain chains, valleys, and plateaus that lie hidden beneath the seas. From the eastern shores of the United States, ships sail above continental slopes, extending far out like a great shelf, beyond which is a vast rolling plain, unbroken until it rises and forms a great ridge of mountains south of Iceland, virtually dividing the waters.

SHEETS OF METAL TO REPLACE PLASTER AND WALL PAPER

Thin metal sheets are being used instead of plaster and wall paper in France. Among the advantages claimed for the plates are that they cost less, and can be put on cheaper than the old materials. The air in a house thus equipped is said to be easily maintained at an even temperture, as the walls are almost air-tight. The sheets, which are sold in standard sizes, are mounted on laths. They are stamped with decorative designs which can be painted in any colors desired. A dwelling lined in this way is also reported to be proof against many insect pests.

HOLDER FOR SERVING SPOONS KEEPS HANDLES FROM FOOD

To prevent spoons from slipping into food in a serving dish, a metal holder, to be attached to the rim of the vessel, has been placed on the market in Europe. It is



Metal Holder Placed on Edge of Serving Dish to Keep Spoons from Slipping into Food

specially designed to keep the handle of a ladle well above the edge of a container for sauces, gravy, and other liquid foods.

PICKS AND SHOVELS TO RIFLE OLD TOMBS OF MYSTERY

While excavators are exploring the last resting places of ancient Egyptian monarchs, other scientists in a half-dozen places are seeking out more old mysteries of that country. Others are at work in the fields of Greece and near-by Asiatic lands. All over the world, men with picks and shovels are striving to dig up and reconstruct glories of other days. Explorations planned for the future are expected to add substantially to vast collections of relics now being studied. Digging is to be resumed at El Amarna, site of the city founded by the father-in-law of Tut-Ankh-Amen.

METAL SPLINTS FOR FRACTURES EASILY ADJUSTED

Adjustable aluminum splints, designed to be used on any kind of fracture, were exhibited at a conference of surgeons in the middle West recently. They are held together with rivets and bolts and can support any part of the body rigidly. Be-

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Patient with Limb Set in Metal Brace that Replaces Splints for Broken Bones

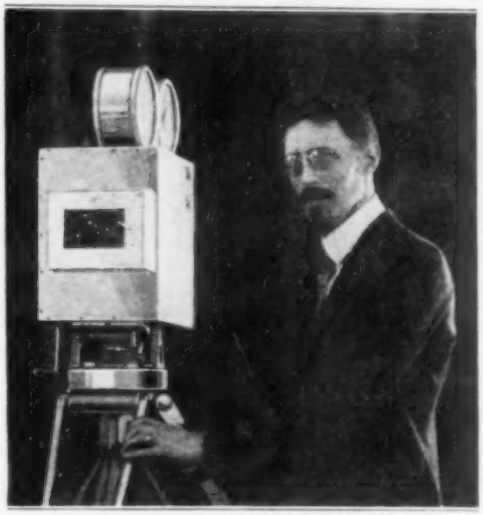
cause of their construction, they allow for free circulation of air around the injured parts.

GAS FORMED IN GRAIN CARGO RAISES SUNKEN SHIP

Gas, generated by saturation of grain by water, recently raised a ship that had lain deck downward on the bottom of the Mediterranean Sea since 1916, when it struck a floating mine. As the vessel reached the surface, keel upward, it turned over and the gas, rushing through openings in the deck, exploded. Grain was blown high into the air and scattered over the sea, while the boat filled with water and sank again.

LIFELIKE MOVING PICTURES TAKEN BY SUPER CAMERA

Moving pictures that "stand out" from the screen as naturally as though the objects were being viewed through a window



Huge Camera for Taking Motion Pictures that Appear to Have Depth on the Screen

have been produced by a camera and projecting machine designed by a middle-western inventor. Films three times the size of those now in use are employed. The screen is 40 by 20 feet in size. Through the application of the principle of the stereoscope, or double vision, the pictures have the appearance of possessing depth instead of the present flatness. Also, there is no distortion when viewed from the side.

NOTCHED WEDDING RING WORN TO DENOTE DIVORCE

Many women in England, who have been divorced from their husbands, continue to wear the wedding ring, but have a fracture cut in it by a jeweler, as an indication of that fact. Those who have parted from more than one husband have notches to indicate the number made in the edge of the gold band, it is said.

¶More than 100 different languages are spoken in India.

SPRING CLIP ON RACQUET HOLDS TENNIS BALLS

For conveniently carrying tennis balls, a spring clip holding two of them, attaches to a racquet press. Encircled by the wires,

Spring Clip Attached to Racquet Press, Holding Tennis Balls Firmly without Cutting Them

the balls are held firmly in position with no danger of the rubberized fabric being cut, and a slight pressure on the device releases them.

STEAMSHIPS ON NIGHT TRIPS CARRY ILLUMINATED ADS

To advertise their products, certain English firms equip ships that ply at night with gigantic electric signs. The ads are made of sheet metal 10 feet high and are carried between the vessels' masts by ropes. Hundreds of bulbs flood them with light. By a mechanical arrangement the current is alternately turned off and on, a

English Steamship Equipped with Electric Signs Spelling Advertising Messages During Trips at Night

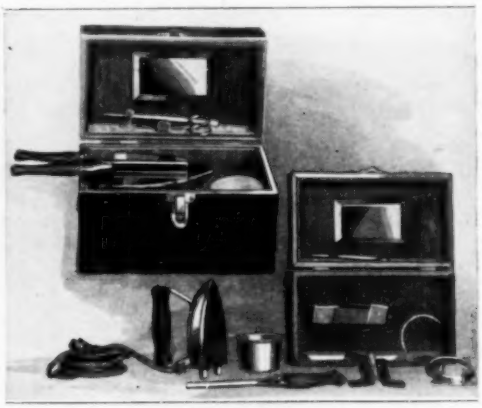
different letter appearing each time and the message is spelled out to the observers.

FOOTPRINTS IN STONE MAY MARK EARLY WHITE RACE

Huge footprints impressed in the surface of Enchanted Mountain, in the southern Blue Ridge range, have led to the belief that perhaps America was at one time in the prehistoric past inhabited by a white race of immense stature. The tracks seemingly were made when the stone was still soft soil. There are 26 outlines of the human foot, all bare except one, which evidently was incased in a moccasin. One of these prints measured more than 17 inches in length and over 7 inches in width. Beside it is the mark of a finely shaped hand. Old Indian legends tell of a mysterious white race that once occupied that region.

ELECTRIC IRON IN VANITY SET FOR TRAVELERS

More compact than a small handbag, a toilet set has been devised by an eastern man for the use of women travelers. Fit-



Vanity Case for Women Travelers that Contains Electric Iron, Heating Cup, and Hair Curler

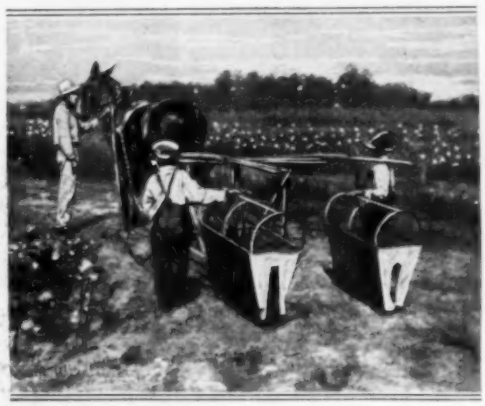
ting securely into a socket at the bottom of the case is an electric iron with a curling iron attached to it. A holder is also included for a cup which may be used for heating liquids. The entire equipment weighs slightly more than five pounds and may be conveniently slipped into a traveling bag. It contains many other implements generally found on the dressing table.

¶Vaccine for the dreaded foot and mouth disease, prevalent among cattle, has been discovered in France; it is expected to check the mortality among the animals.

TRAPPING BOLL WEEVIL IN FIGHT ON PEST

Armed with Traps, Cotton Workers Labor to Rid Crops of Destructive Boll Weevils. This Method Is Believed to Be as Effective as Poison, and Less Expensive

Finding the poison-dust method too expensive, small cotton growers of the South are using traps to rid their fields of boll weevils, which annually cause enormous loss. One of the most popular snares, easily made by the planter, is formed by wrapping finely meshed screen around two semi-hoops, which are connected at the bottom to a trough. These, mounted on a sled drawn by a horse or mule, or carried by laborers, are taken through the rows of plants, the dangling wires inside them brushing off the insects. At the end of each row, the weevils are removed and destroyed. Although inexpensive, this system has been found to materially increase the yield.



Hitched to a Mule, These Snares Clear Two Rows at a Time

TWIN TUBES IN TUNNEL CARRY TRAFFIC BENEATH RIVER

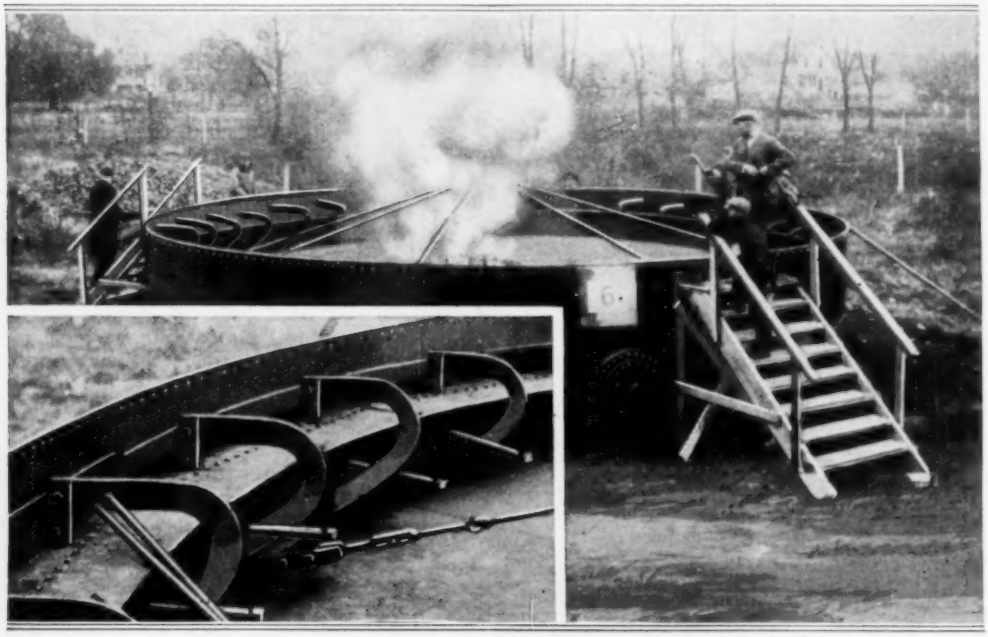
In constructing the Hudson River traffic tunnel between New York City and New Jersey, engineers are said to have provided a means of clearing the 14,000 feet of traffic tubes of noxious gas fumes that will be generated from thousands of automobiles passing through them. The tunnel will rest on concrete and steel piles imbedded in solid rock 250 feet below the river bed and will consist of two channels, each big enough for two lines of travel. Under the river, it will be 3,375 feet long, but its total length, including the approaches, will be 9,250 feet. When the plans were first drawn, experts estimated that the structure would prove adequate for at least ten years. Recent traffic surveys have caused them to cut five years from that period, and there are indications that further modifications will be made. The tunnel's capacity is figured at 46,000 vehicles daily.

HARD RUBBER REPLACES REED FOR MUSICAL INSTRUMENTS

Tone qualities of the saxophone and clarinet are said to be improved, and ease in playing the instruments made possible, by the use of mouthpieces molded from a hard-rubber composition, instead of reed ones. The manufactured article is claimed to be proof against warping, and does not irritate the lips. They come in varying degrees of flexibility and vibrate equally as well as those of cane wood.

FLOATING TOPS FOR OIL TANKS REDUCE LOSSES

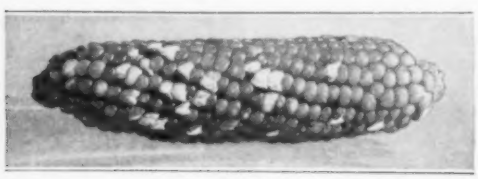
In an attempt to provide means to check evaporation and fire losses, which cost the oil industry more than $200,000,000 a year, a floating steel roof for oil storage tanks has been designed. Resting on the surface of the liquid, the roof would seem to eliminate the fire hazard always present when there is an air space between the surface of the contents and the top of an ordinary tank. It is also claimed that by this means evaporation is retarded. Tests, recently made of the invention, were conducted with a steel tank containing about three feet of water, on which was poured 1,000 gallons of gasoline, covering the water with three inches of the inflammable fluid. After the floating top was put into place, fire was applied to the patented seal around its edge, but the flames did not spread. A torch was also placed at one of the small air vents, and while smoke and flames immediately belched forth, they lasted less than a minute. A bucket of gasoline was poured on the roof and ignited, but after burning five minutes failed to affect the contents of the tank.



Floating Steel Roof for Oil Tanks to Reduce Evaporation and Fire Losses by Preventing Air Circulation at the Top: Left, Sealing Braces that Make Edges Tight

POP CORN BURSTS OPEN IN HEAT OF SUN

Pop corn popped in the field by the sun's rays is reported from northern California. Kernels of a dozen ears in one field, it is said, had burst out crisp and almost as full as though they had been placed over a fire. The owner found that the corn, of a kind which pops at a lower temperature than usual, had ripened to full maturity and grew in a place where it was directly exposed to the sunlight. Ears in more sheltered parts of the patch were not affected.



Cob with Pop-Corn Kernels that Were Burst Open by Heat of Sun

¶Road building belongs close to the top in the list of big businesses in the United States, according to an estimate compiled by the Bureau of Public Roads. This estimate announced that 40,000 miles of surfaced roads were built last year.

CITIES HALF CENTURY HENCE TO BE "BUILT IN AIR"

Moving the calendar ahead fifty years, some noted experts see American cities with towering skyscrapers, beside which even the tallest and most beautiful buildings of today will seem very ordinary. Even the small towns will have structures as large as those now considered huge. Street traffic will have been almost eliminated, workers will travel in subways, dirigibles, or on elevated roads at high speed. The telephone will have added improvements. Radio sets will be essential in every office and home. Houses will be heated by electricity in a few minutes, and little coal will be used in either homes or office buildings. The camera will have been discarded for pocket motion-picture outfits, and "movies" in the theaters will have been given speech. College students will report their lessons by wireless, and ministers will broadcast their sermons.

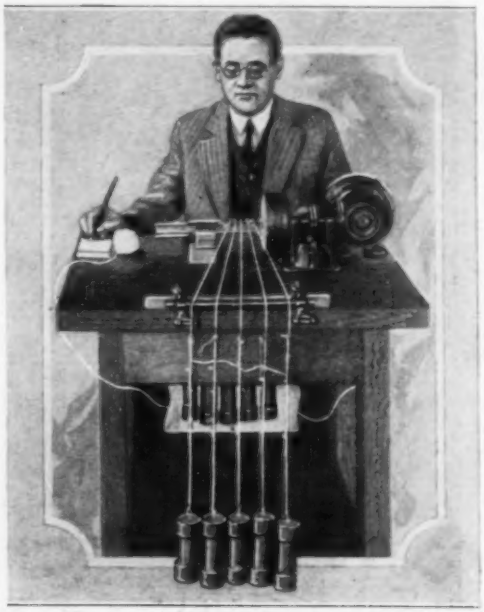
ODD-SHAPED EGG BEATER DOES WORK RAPIDLY

For whipping eggs, a beater with a coiled-wire base is being made which does the work rapidly and thoroughly. It is operated by an up-and-down motion of the hand. The coil flattens out on the downward stroke and as it springs back, draws the egg with it, producing air bubbles. It does not tire the arm, it is claimed, and is readily cleansed with hot water.

Coiled-Wire Egg Beater that Works by Strokes that Compress Spring Base

TESTING CORDS OF NETS CUTS NATION'S FISHING BILL

Through tests of various kinds of cord used in making nets, government experts



Testing Cords that Are to Be Used in Fish Nets to Determine Strength

have devised a method by means of which fishermen can prolong the life of their old equipment. As a result, it is estimated, persons who seine the waters of the deep for sea food have been saved more than $2,000,000. Pieces of many types of twine are examined for strength and durability, and the facts thus determined are made public to aid weavers in turning out products which give longer and better service.

HUNT FOR ORIGIN OF AMERICA'S NAME LEADS TO DARK AGES

Delving into ancient documents, experts disagreeing with the theory that Americus Vespucius was responsible for the name of America, point out that Indians called this land "Amaroke" long before the white man came. Researches, it is said, have shown that the word, in one form or another, was widely known in prehistoric times as the name of the "new world." In a highland region of Nicaragua, a province is still called Amerisque, a title it has retained since early antiquity. Because of this and other findings, certain authorities believe that Vespucius took his name from the new hemisphere.

FORESTS BURNED TO INCREASE GROWTH OF TREES

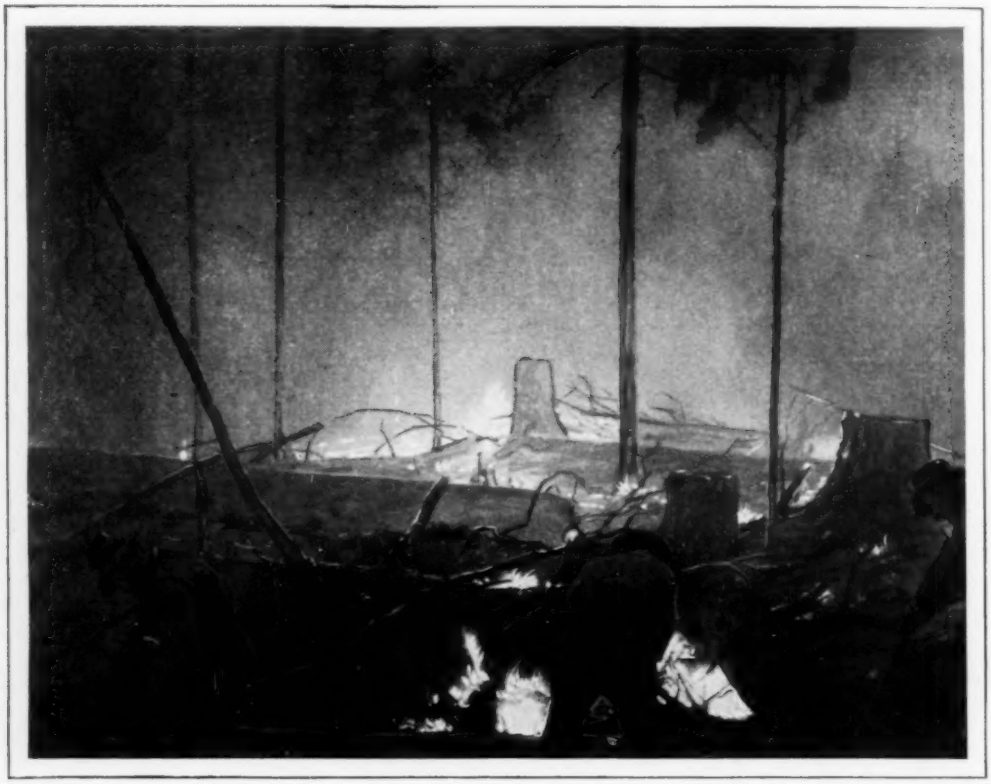
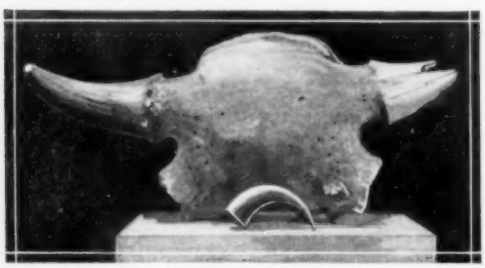


Photo Courtesy American Lumberman

Kindling Fires in Forest of Valueless Trees to Clear Ground for Planting Better Timber: Only Expert Woodsmen Are Permitted to Take Part in this Work

Timber "stands" of little or no commercial value are being removed by fires to clear the tracts for the planting of fir trees, the wood of which is in great demand by the lumber industry. These fires are kindled in the woods of the West by squads of men trained in the building and control of such blazes. This treatment is usual over land occupied by inferior growths of hemlock and "scrub." When the fire-hazard season in the forest ends, the work of clearing begins. In one state a law requires that this be done at least once a year. Fires started in the spring sometimes smolder until late summer and then break out with such fierceness as to cause big losses before they are extinguished. Cold and damp weather after autumn is selected as the best time to do the burning.



Skull of Prehistoric Cow that Lay Buried for 50,000 Years in Bed of Western River

SKULL OF STONE-AGE COW DUG FROM RIVER BED

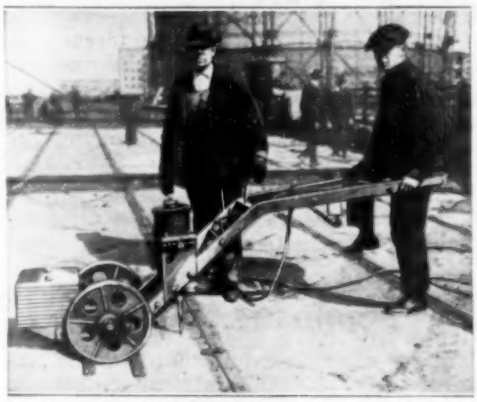
Dredgers working in a western river have recently uncovered what is believed to be the skull of a broad-faced cow which was buried for at least 50,000 years, below the bottom of the stream. The animal to which the fossil belonged, scientists say, was the forerunner of the buffalo, the cow, and others of the bovine family. Horns measuring 20 inches around their base were still attached to the specimen.

EVIDENCE OF EARLY ROMANS FOUND IN NEW GUINEA

Bits of pottery and part of a sword believed to be of Roman origin lately found in the Humboldt Bay region of New Guinea, have partly convinced explorers that wandering galleys may have reached the northwestern end of the island more than 2,000 years ago. Further evidence to support the theory is the fact that several words in the dialect of the natives are derived from Latin roots, scholars say, and an old legend which has become part of the folk lore of the inhabitants strengthens the belief. They tell of a huge, many-legged beetle that climbed out of the sea ages ago, carrying men on its back who camped in the bushes near by while it rested on the sands. It is now believed that the "beetle" legend arose from the appearance of a Roman galley, the legs having been, in reality, the long oars of the vessel and the men hardy adventurers who had drifted far from their native shores. Though there is no account of such a voyage in Roman history, it is pointed out that the men who reached the island may never have returned home to tell of their exploit.

ELECTRIC DRILL ON WHEELS CUTS CONSTRUCTION COST

With an electric drill mounted on wheels, an eastern firm has found a way of reducing construction costs, as the device does the work formerly performed by many men and in much less time. It has been employed in drilling rivet holes on a viaduct job, only two men being required to operate it, one to hold the frame at the right angle while the other guides the drill.



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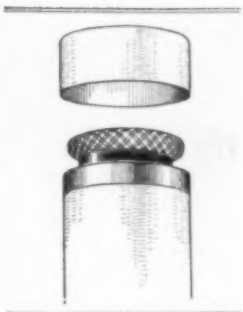
Electric Drill on Wheels that Is Easily Moved and which Two Men Can Operate

CLOTH SHIELDS PROTECT AUTO WHILE MECHANICS WORK

To protect the interior of an automobile from dirt while it is being overhauled by mechanics, cloth covers are being used, which fit snugly over the various parts. By this means, workers can perform their tasks without danger of soiling the car. Such shields may be placed on the steering wheel, gearshift, and brake levers, while the upholstery is guarded from the greasy clothing of the repairmen in the same manner. They also prevent scratches for tools used by the workmen.

Snugly-Fitting Cloth Covers Protect Surface while Auto Is Being Repaired by Workmen

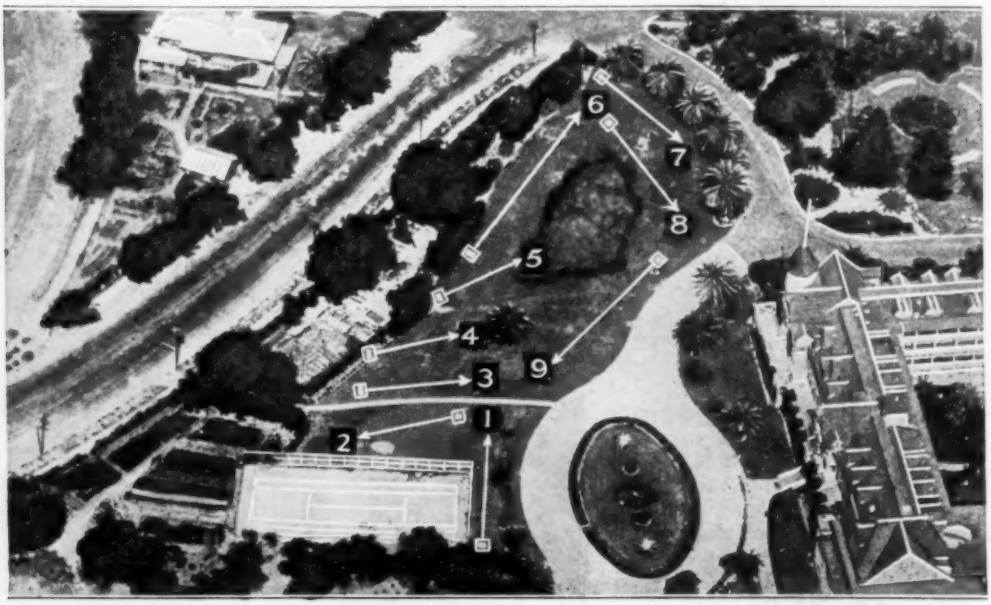
CAP FOR "SQUEEZE" CONTAINER PREVENTS LEAKAGE



Instead of the usual caps for tube-shaped "squeeze" containers, patented covers are being made in Europe which spread the contents evenly and cleanly over surfaces as it comes out of the holder. They are suitable for applying pastes, shoe cream, shaving soap, and similar commodities. Protecting lids fit over the device when not in use, keeping them from leaking.

ENTIRE GOLF COURSE LAID OUT IN CITY BLOCK

Within the area of a single city block, a triangular spot at the intersection of three streets, a western hotel has laid out a nine-hole golf course, with hazards and bunkers, like a ground of the regular size. By cleverly arranging the greens and reducing the usual distance between them, the engineers were able to confine the links to the limited space. Built for patrons of the hotel, it provides a recreation field within the heart of the town, where guests who are enthusiasts of the game can play without journeying farther than across a thoroughfare.



Miniature Nine-Hole Golf Course with Bunkers and Hazards Laid Out for Hotel by Engineers in the Space of a Single Triangular City Block

ICE FROM ANCIENT GLACIER PRESERVES SHIPPED FISH

Ice formed centuries ago in the glaciers of the North is used at an Alaska cannery to keep fish fresh while being shipped to the markets. Unable to meet the expense of a cold-storage or refrigerating plant, the owner of the cannery makes use of the fields of ice near by. A fleet of gasoline launches keeps the storehouse filled by making frequent trips to the fields.

Age-Old Glacier Supplies Ice to Keep Fish Fresh Till Arrival at Market

MISSING LINK OF FOSSILS FOUND IN MONGOLIA

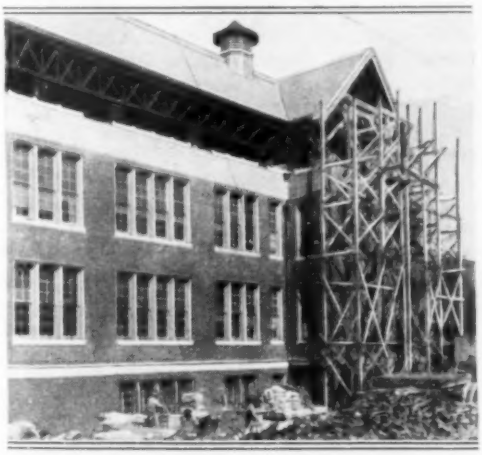
Science has linked the horned and unhorned reptiles. An American expedition, recently returned from Mongolia, found fossils in such numbers that one hundred years will be none too long in which to study the finds. Two discoveries were outstanding: a complete skeleton of a dinosaur with collar of plated bones, and about twenty-five eggs, one of which contained a perfect embryo of the species. The collared skeleton forms the missing link between the horned and unhorned reptiles.

RADIOPHONE ON LINER WORKS LIKE WIRE INSTRUMENT

Differing only slightly from the ordinary broadcasting outfit, a wireless-telephone set has been put on a large ocean liner plying between New York and England, which performs in a manner identical to that of the land wire instrument. A conversation may be carried on and the speakers can break in on each other's talk in the ordinary way. With the aid of shore operators, it will soon be possible, according to experts, for passengers and officers of the vessels to establish contact with friends or business associates in their homes or offices, and speak to them with the same ease that conversations over the "wire" are accomplished.

ROOF OF BIG SCHOOL HELD UP WHILE STORY IS ADDED

In adding a story to a big school building in an eastern city recently, the roof was supported at a height of 12 feet above



Inserting Extra Story at Top of School Building after Roof Was Raised

the walls. The extra floor was then built in over a space 150 by 75 feet. When the work had been completed, the top was lowered and secured to its new base. Large jacks, all operated at the same time, were employed for the task, which was carried out without damage to any of the structure.

¶Writing on the back of an ordinary postcard, a French bank cashier recently succeeded in inscribing 203 lines, containing 17,450 words, equivalent to the amount of print on two pages of a newspaper.

RESERVOIR IN FLOWER BOX FEEDS WATER TO PLANT

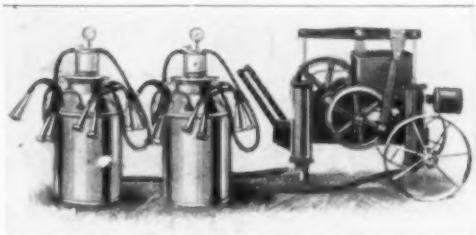
Plants and flowers may be kept fresh and healthy all year round with very little attention by a self-watering steel box that

Flower Box that Keeps Plants Fresh Year Round and Requires Water Once a Week

has been patented. Moisture and air are directed to the roots through a series of perforated tubes fed from a reservoir that requires filling only once a week. It is said the plants cannot be overwatered by this device. A pipe with an opening receives the supply of water and acts as a reserve tank, in addition to carrying air beneath the soil.

MILKER WORKS LIKE HANDS AND IS SELF-CLEANSING

Milking at least 18 cows an hour, a gasoline-driven, self-washing machine, designed to save time and labor, is being made which can be operated easily by a boy or a woman. Copying the gentle, easy motion of the hands, but performing the task more uniformly, the apparatus is said to be less annoying to the animals. A wide wheel base prevents it from tipping and makes it easy to move over uneven



Self-Cleaning Milking Machine that Performs Work as Gently as when Done by Hand

surfaces. Between milking times, the engine can be used about the farm or dairy to run other light machinery.

NATION'S CAPITOL IN MINIATURE IS PRIZED MODEL

Regarded as one of the best products of the modeler's art, a miniature reproduction of the nation's capitol is admired every year by thousands of visitors to Washington. It is on display in a special room along with other valued relics. In minute detail, it pictures the gracefulness and grandeur, the broad steps, wide facades, and towering dome of the imposing edifice, where public servants watch and direct the destiny of the republic. It was made 15 years ago by a French artist to guide architects who were at that time considering plans for extending the original building. Through the years it has been on exhibition, it has been carefully guarded from curio seekers, who perchance might have defaced it.

Valued Model of Nation's Capitol, Showing all the Beautiful Lines of that Imposing Structure, which Is Viewed Annually by Thousands Who Visit Washington

PICTURES WOVEN IN RUGS SHOW RACE'S GLORY

Past glories of the Navajos, now hardly more than legends, are kept alive in the government Indian schools, which teach the children of that tribe how to weave pictures into rugs and blankets. Patiently working at a hand loom, not much different from those used by their ancestors, the students make designs in the yarns, which proclaim the deeds of some chieftain, long since dead, or other achievement in the romantic history of their people. The word-of-mouth stories, from which these subjects are drawn, have been handed down for centuries. Although the Navajo population is dwindling away, these tales of a power that once was theirs are still cherished.

Navajo Indian Girl Weaving Story of Past Glories of Her Race into Rug

BRIGHT-COLORED WALLS CUT COST OF LIGHTING

How bright-colored walls reduce the cost of lighting, by reflecting rays, and how dark tints increase expenses, by absorbing beams, were shown in some recent tests by British decorators. To keep a room bright they found that white serves best, as it takes up only thirty per cent of the brightness, and that deep chocolate is least desirable, as it absorbs ninety-six per cent. Between these, in the order of their value, are chrome yellow, orange, yellow, light pink, emerald green, dark brown, vermilion, blue-green, and cobalt.

HUGE PLUME COMBINES BEAUTY OF TEN THOUSAND FEATHERS

In making a display recently, the owners of a western ostrich farm composed a single, beautiful plume of 10,000 white feathers of the finest quality. It weighed 250 pounds and was 15 feet long and 8 feet wide. The material alone was worth eight thousand dollars.

Machine-Made "Stars and Stripes" Replace the Flags of Betsy Ross' Day

Uncle Sam's Factory Turns Out Nation's Colors

IT is a far cry from the handmade flag of Betsy Ross to the production of flags by machinery, and yet the cradle of the "Stars and Stripes" has remained in Philadelphia since the symbol of our nation was born there 145 years ago. The traditional scene of this woman patriot patiently fingering the colors of a new nation, has shifted to the operation of scores of machines, increasing production a thousandfold.

Yet, Uncle Sam's flag factory is maintained in the Quaker City, as a branch of the War Department, charged with the responsibility of making all the flags used by the army. This obligation involves the manufacture of a variety of forms of the Stars and Stripes, and storm flags. There, are also made automobile, distinguishing, and transport flags, and ensigns, harbor-boat "jacks," and pennants, together with guidons in vast assortments.

The making of "Old Glory" in great quantities and in response to the dictates of economy is of comparatively recent origin. Progress in this direction has marked time with the development of the needle-machine industry. Not unlike Betsy Ross, who fashioned the national emblem with her fingers, not so very long ago an entire flag was constructed by a single operator. Today, the task is allotted to 13 units of operation. Each worker in Uncle Sam's flag factory is assigned the task of contributing a definite bit of workmanship, these progressive units making for a finished product.

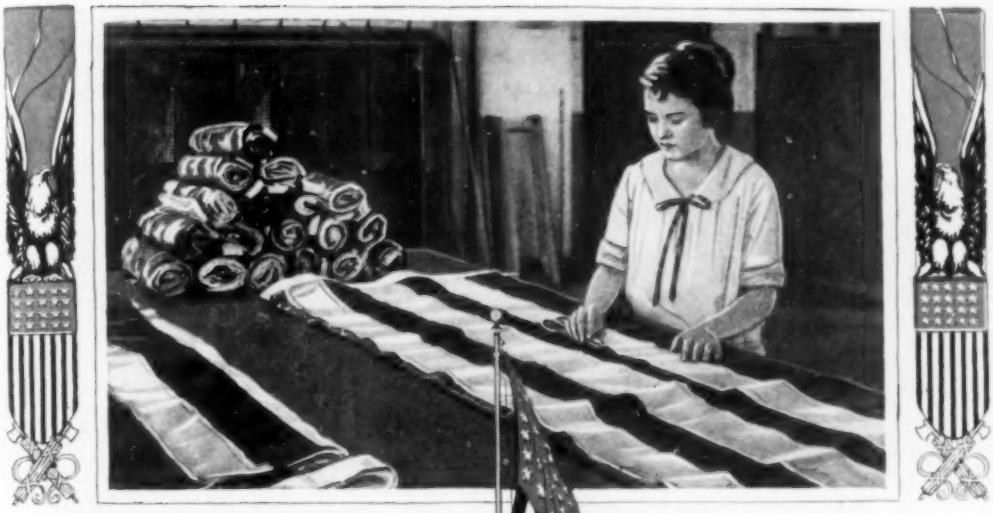
Bunting—a thin woolen stuff used primarily for making flags—is painstakingly inspected before being issued to the machines. It is placed one ply upon another and divided into specified lengths until a section 100-ply high is available. Then the material is marked and subjected to an electrically driven cutting machine, which parcels the bunting into strips of two sizes, these entering into the manufacture of the stars and stripes. The procedure followed with the blue bunting for the field is not dissimilar to that of cutting the long and short red and white stripes. The elasticity of the material involves the exercise of utmost care in the laying out and separating of it, lest precision be sacrificed, as accuracy is necessary in joining the stripes on sewing machines. Stars are made by cutting them out with a steel die on a stamping machine. This insures maximum production and uniformity in size and shape. The canvas heading on the flag is fashioned in a similar manner.

"Old Glory" in Days of Betsy Ross

After the cutters have performed their work, the different parts of the potential Old Glory

Although Machines Now Do Most of the Work, Women's Fingers Still Put Finishing Touches to Nation's Colors

Stitching the Stars on Blue Fields in Uncle Sam's Flag Factory



are bundled together and consigned to the operating room. The short stripes are joined together, alternately red and white, on a double-needle sewing machine, which negotiates two rows of stitching at the same time. In like fashion the long stripes are joined and the field is made. The blue fabric is placed on a table, all wrinkles removed, and the correct position of the stars indicated on each field by a perforated pattern. After being subjected to a squaring process it is cut to exact dimensions. A piece of white percale is fastened on the underside of the field, and a star placed in the same position on the upper side. This insures three thicknesses of cloth. The operator then sews cautiously around the edge of the star with a zigzag machine. Once the stars have been fastened on the field, a trimmer cuts off any excess percale on the underside.

The blue ground and short stripes are then united and both are joined to the long stripes. Then, the flag is smoothed out again on a table, and squared and cut to precise dimensions. The fly end is turned in and hemmed with three rows of stitching. The other end is reinforced at each corner with a triangular strip of bunting and stitched into a canvas heading. It is strengthened by means of a heavy stitching, and each flag is equipped with a galvanized iron staple and ring for hitching to the halyard, the rope or tackle by which it is raised and lowered on the mast. The completed national emblem then undergoes a rigid inspection and, if approved, is folded and consigned to supply headquarters for disposition.

Stars, contrary to the hand-fashioned articles of Betsy Ross, are manufactured of solid embroidery silk on a machine. The blue-silk fields are placed in frames on this mechanism, which is capable of producing a stitch not unlike hand embroidery—that is, both sides are alike. This machine, provided with numerous needles, all threaded with white silk, perforates the field, back and forth, thus laying out the design for the embroidery stitching.

National colors are carried by unmounted troops, and standards by mounted military units. The inconsequential distinction between the two is that the standards are not as large as the colors and do not possess cords and tassels. The colors are four feet four inches at the hoist (top to bottom), and five feet six inches at the fly, which is the length stripeways.

PIANO HAS DOUBLE KEYBOARD TO SIMPLIFY FINGERING

With a double piano keyboard devised by an eastern man, fingering of the keys has been greatly simplified. Duets that

Double Keyboard for Piano that Simplifies Fingering and Is Convenient for Duet Playing

ordinarily require two instruments may be played on the same one. The keys are so arranged that the players do not get in each other's way. The same inventor has designed a single keyboard, intended to simplify fingering, that can be installed in place of the usual type without making changes in the case or action. In this pattern, the white keys are the same width at both ends, so that they can be touched either in front or behind the black ones, which are shortened for that purpose.

FATHER OF BASEBALL HONORED BY MEMORIAL PICTURE

Recalling the growth of baseball's popularity, an oil painting was hung in an eastern railroad station recently as a memorial to Major-General Abner Doubleday, "inventor" of the national game. While playing with boys in a field near the village almost a century ago, he devised rules to govern plays and marked out a 90-foot diamond on the ground with a stick. This dimension still applies to those laid out nowadays. However, the original rules of the game have been modified, changes have taken place in the styles of the ball, and gloves, pads, and masks have been altered.

RIVER MADE RIBBON OF FIRE BY WRECKED OIL TRAIN

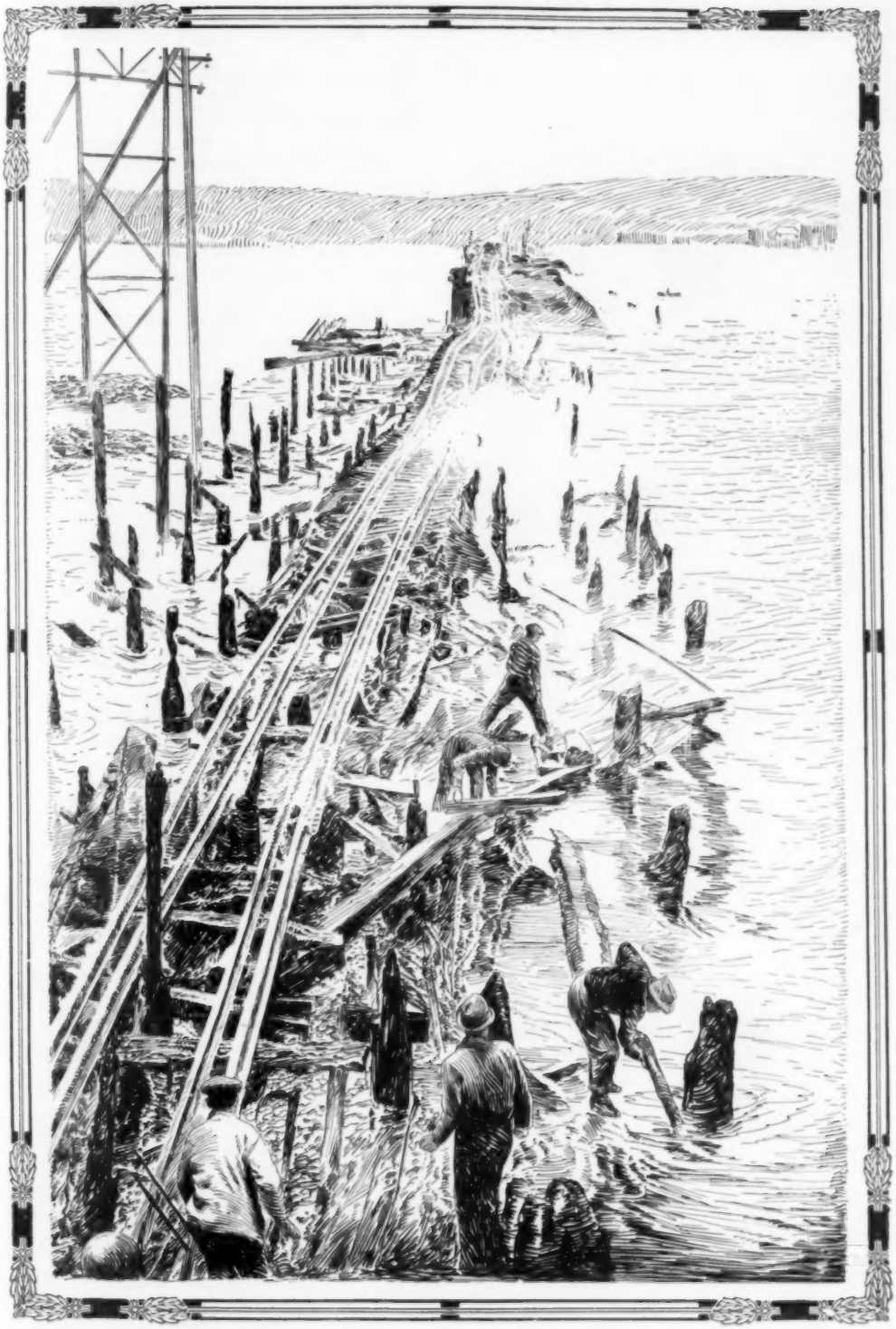
Part of the bridge over which it was passing was torn away when an oil train on a mid-western railroad was wrecked recently by one of its cars that jumped the track, derailing 14 other tanks. Burst by the crash, the steel containers rolled into the river below and took fire, pouring a flood of burning oil over the surface of the water. The heat and flame grew to such heights that the metal framework of the bridge was quickly reduced to a mass of melted and twisted iron. Passing into the middle of the river, the flaming fluid moved downstream, spreading as it went, until it became a veritable ribbon of fire. By valiant work, the wrecking crew of the railroad, assisted by firemen from near-by towns, succeeded in extinguishing the flames. The damaged bridge was replaced in a few days by a temporary structure.

LIGHT WITHOUT HEAT SOUGHT IN ELECTRIFIED VACUUM

Hoping to produce light without heat, as the glowworm is said to do, but in a different manner, a French scientist passes an electric current through a vacuum tube of glass, lined with a phosphorescent material. With a small amount of energy a glow of extreme brightness is created.

COFFEE MILL LIKE CARTRIDGE COMBINES GRINDER AND POT

Combining a coffee grinder and pot, a brass mill used in Albania, an old country of eastern Europe, looks like a large empty gun shell. Made in two sections, the top part contains the grinding wheel, turned by a handle that can be folded up, and the bottom chamber receives the coffee after it has been ground into powder. Sugar is mixed with the powder in this "pot." Hot water is added and the drink is served in tiny cups without straining. Decorated with exquisite hand carving, it becomes a thing of beauty.



Reduced to a Mass of Charred Timbers and Twisted Metal by a Cascade of Flaming Oil, this Railroad Bridge Was Replaced in a Few Days' Time by Valiant Workers

BASS VIOL SO LARGE PLAYER STANDS ON PEDESTAL

Measuring 14 feet from tip to base, a bass viol has been made by a western man, who claims it is the largest in the world.

Giant Among Bass Fiddles that Can Be Played Only from an Elevated Platform

In order to play it, the musician must stand on a pedestal five feet high. The same maker constructed another of the big fiddles which measured 10 feet. Formerly the largest known instrument of this kind, 11 feet 7 inches tall, was located in New York. It required two players, one to stop the strings and the other to handle the bow.

BLOW FROM GIANT HAMMER TESTS RAIL COUPLINGS

To prevent railroad accidents, car couplings and drawbars are carefully tested by a recently devised machine. Fastened to a heavy anvil, they are subjected to the blows of a two-ton hammer. Each piece must withstand several impacts without cracking and without showing dents beyond certain definite limits. If the coupling should break, the hammer continues the motion of the stroke and travels up two circular tracks, fitted with teeth, which keep it from damaging the machinery by preventing another stroke.

PHOTO TEST FOR EFFICIENCY REVEALS LOST MOTION

How efficiency of workers is reduced by lost motions is being shown through detailed photographic studies. Observation of bricklayers of ordinary training, who are said to use the same methods that have prevailed for 7,000 years, and of that most ancient of craftsmen, the berry picker, are said to give no indication that the best way to do these tasks is to follow instinct. The layer of brick can be trained to do three times as much work with the same effort, according to the tests. Similarly, the berry picker can increase his harvest fifteenfold, it is said.

AIRSHIP WITH FLAPPING WINGS TO TAKE FLIGHT LIKE BIRD

With flapping wings, shaped like those of a bird and moving in much the same manner, an airship recently built by a European mechanic, it is said, gets its power from pedals operated by the flier's feet. The machine is of light but strong construction and the pilot's seat is in a canvas inclosure. An early record of similar attempts to imitate the birds contains an account of an English monk, who strapped crude wings to his shoulders and jumped from a high cliff. The trial ended in failure and injury to the experimenter, who fell to the ground like a shot.

TINY CLOTHES WASHER CLEANS DELICATE FABRICS IN HOME

Cleaning like larger machines, a miniature electric clothes washer is being made which, it is said, handles without injury, garments that housewives do not care to send to a laundry. Blouses and lingerie of light material, and other pieces of delicate fabric can be run through it without risk of being torn. No larger than a kettle, it can be set on a stove to heat the water and removed to a table for operating. It is small enough to use in the bathroom or on the drain board of the kitchen sink. Durable, as well as light and compact, it can be easily stored out of the way when not required.

Strange Scenes in the World's Dark Corners

Civilization Still Fails to Attract Millions of Wild Tribesmen

RETURNING from travels across the "no man's lands" of the uncivilized spots of the world, hunters and explorers tell of seeing people and animals and passing through adventures so strange that they were impelled to take the evidence of them by trap or camera, even though these things did not come within the purposes of their trips.

Recently, a young member of an exploring party which had entered the forbidden regions of Tibet in Asia decided to take up the venture alone when the rest of the party turned back at one of the most dangerous points. Selecting a few native servants who declared they were brave enough to accompany and assist him, he resumed the journey through precarious wilds.

As the party proceeded, the natives began to lose courage, until after a great deal of jabbering among themselves, one who seemed to be the leader approached the explorer with the information that they had voted to abandon the trip. Entreaty and the promise of more money failed to persuade them to go on. Then, flying into a rage, the young scientist leaped into the midst of the cowardly crew and administered to several of them a severe pommeling with his fists until they agreed to continue the trip.

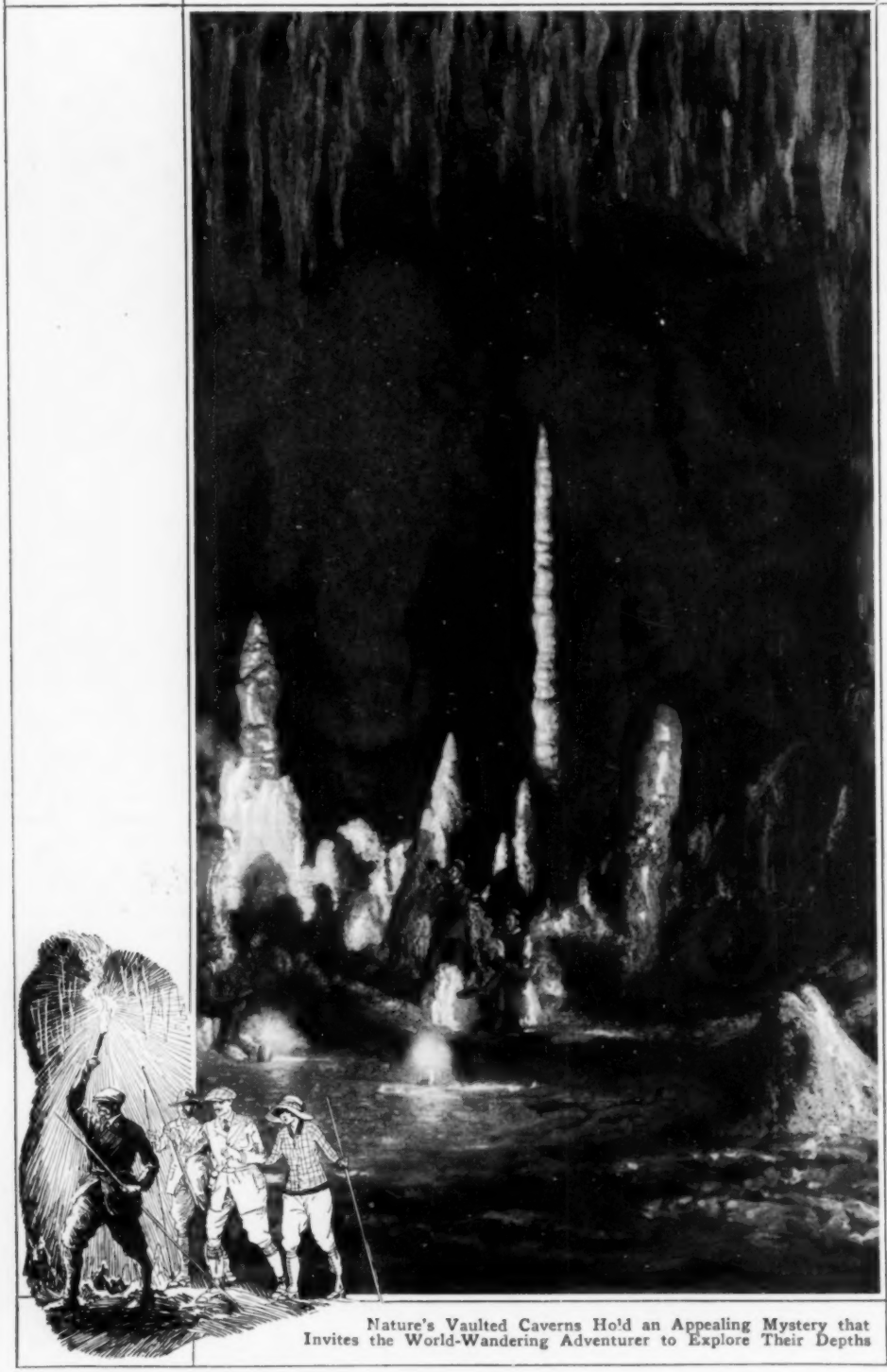
Appointing their leader as chief of the party and with himself disguised as a cook's helper, they went on. Even the suspicious outposts set to guard against such intrusions failed to note anything about them that would warrant arrest. After weeks of weary travel, during which sickness often laid out almost his entire company, he arrived at a town where he became bold enough to reveal himself to the ruler of the tribes. His visit with that individual won him the right to gather data and relics of ancient peoples of that country.

Travelers on the Dark Continent Are Often Beguiled from Their Journeys to the Chase of Big Game

Racked with fevers, their clothes and shoes torn by battle against almost impassable jungle growths, a party lately returned to civilization from an expedition into the upper Amazon River in South America, told of scaling jagged peaks to catch eagles, wading through swamps filled with deadly reptiles, and struggling with wild tribesmen disputing their path into forested depths.

Fevers and strange diseases made the native guides wary of venturing far into unknown territory. Frequently, game was scarce and they had to subsist on nuts and wild fruits. The ammunition supply ran out, and had it not been for the guides, who killed birds and animals with bows and arrows, starvation would have loomed as another enemy to fight.

Cannibal tribes were met. Short skirmishes ensued in which they were driven off by the white men's wea-



Nature's Vaulted Caverns Hold an Appealing Mystery that Invites the World-Wandering Adventurer to Explore Their Depths

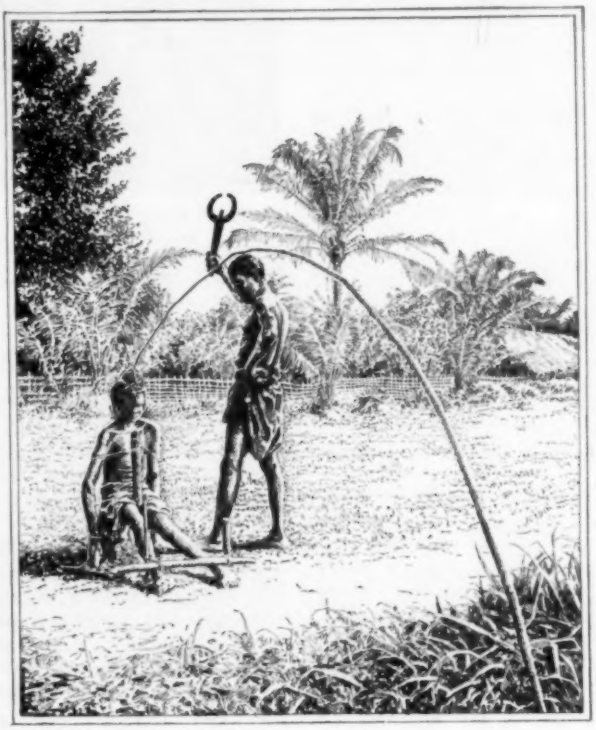
Adventure Causes Remote Places of the Earth to Be Invaded by Camera, Gun, and Trap, Instruments that Often Bring Marvelous Revelations to the Halls of Learning

pons whose noise struck them with terror. Other dangers lurked in the marshes and underbrush, in which were found boa constrictors, man-killing beasts, and poisonous insects that attacked their victims in clouds, their bites often causing illness.

In the waters were vicious fish but a foot long, so strong that in taking one alive, a member of the party suffered the loss of a finger bitten almost off by its powerful jaws.

One of the first animals to be captured in the forest was a "coati mundi," a bright-red little fellow of the raccoon family. So fierce was it, that two dogs were torn to shreds before it finally was entangled and caged by the guides.

Cannibal peoples have also been discovered, recently, in Australia by game hunters, who have come onto several tribes which have revived their gruesome practice during the past few years. Tribal fires have been rekindled and the denizen of the "bush" refuses the advances which civilization makes him.



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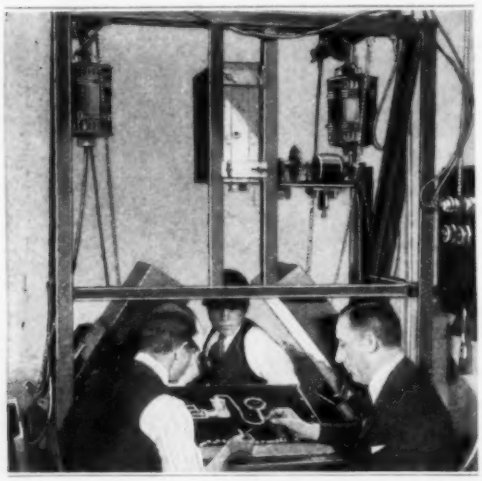
A Kongo Executioner Beheads the Condemned Criminal

In Africa, several of the countries are inhabited by swarthy peoples who have set up local governments that in many cases seem to pattern after those of the white man. While in the quest of big game in the Kongo, a band of white hunters stopped overnight near a native village, where criminals were tried and sentenced by a council of petty chiefs that listened to charges and evidence similar to the courts of more progressive countries.

X-RAY MOVIES SHOW MACHINERY IN OPERATION

All of the interior activities of great power plants, from the water rushing down the penstock to the interior of the



Photos by Harry Levey, N. Y.

Laying Out a Mechanical "Set" from which Movies Can Be Made for Study of Machinery

great turbines spinning under the impulse, are now being shown on the moving-picture screen, true to life in every detail.

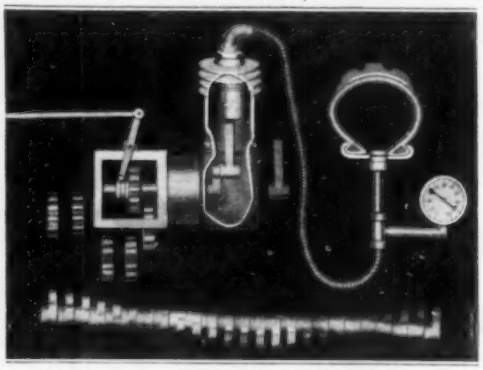
Also, it is possible to exhibit the flow of gases without the use of arrows, dots, and dashes, or other symbols, which would detract from the appearance of reality. Smoke and steam, clouds and lightning, look real and not like drawings. Even the after glare of a flash of electricity glows on the screen.

In displaying the picture of an induction motor and its revolving magnetic field, it is, of course, necessary to assume that electricity looks like something and that magnetism is visible. It is possible, however, to illustrate these and still keep the impression of realism, bringing out clearly, principles that are extremely hard to grasp by the ordinary textbook method.

All this is accomplished through animated mechanical and technical drawings and models, as developed by Harry Levey. The models are usually made of especially prepared fiber board, drawn, cut out, and washed with air brush and by hand so as to resemble closely the real object. One of the secrets of the process is, that where an actual object is presented, the picture does not look like an animated drawing but like the thing itself.

To increase similarity, as well as to facilitate execution, the original objects, themselves, or parts of them, are used with the model wherever possible. The method of photography is somewhat similar to the process used in making animated cartoons, the models being rearranged after each picture, so that when the film is shown, the action will seem continuous. To obtain this effect, there is a base drawing upon which the moving parts are mounted. Paper, cardboard, sheet metal, and other materials are used as occasion may demand. Thus, in making a picture of a power-driven tire pump, a thin section of an actual automobile tire was used instead of a drawing. The ordinary observer is unable to determine where the drawing leaves off or actually begins.

In this way, not only machine action, but surgical operations and microscopic studies may be displayed, and dull, uninteresting statistics, diagrams, plans, and organization and policy charts can be



Cardboard and Disguised Drawings Are Used to Make Machinery Look Real on the Screen

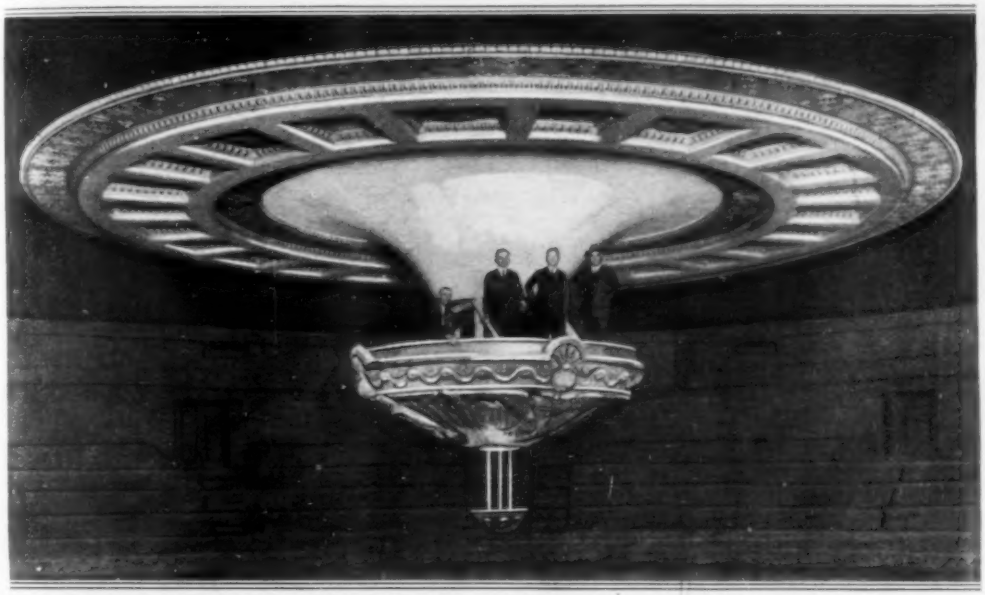
brought to life. Physics, chemistry, mechanics, biology, astronomy, and architecture also may be made plain to students.

LURED BY GOLD, AMERICANS BRAVE SIBERIAN COLD

Lured by the dream of riches, which through the centuries has enabled prospectors to endure hardships, about twenty Americans are braving the northern Siberian cold, panning the rivers for gold, just as their forefathers did in western mining camps 70 years ago. With Chinese, Korean, and Japanese placer miners, they have journeyed many miles inland, over frigid, barren country, ever hoping to make a big strike. Though no one yet has found great wealth, many of the Americans are spending their second winter there.

CHANDELIER SERVES AS BANQUET HALL

Big enough to accommodate a small dinner party, a chandelier, 12 feet in diameter and with all its fixtures weighing over a ton, has been installed in the auditorium of a recently erected building in a western city. Plans already have been made for holding a banquet in it. There are more than 70 light receptacles and reflectors within it, and the rays from these are cast to the main floor 50 feet below by the ceiling, which curves down to meet the bowl. The lower part of it is gilded, painted, and ornamented, and to illuminate it, another cluster of bulbs, sufficient to light a small assembly hall, is suspended from the underside. Access to the chandelier is gained through a trapdoor and a steel ladder from the attic.



Chandelier that Weighs Over a Ton and Is Large Enough to Seat a Small Banquet Party: A Reflector Beneath Illuminates the Outside of the Inverted Canopy

TAGS ON AUTOS GIVE VISITORS TOWN'S TRAFFIC PRIVILEGES

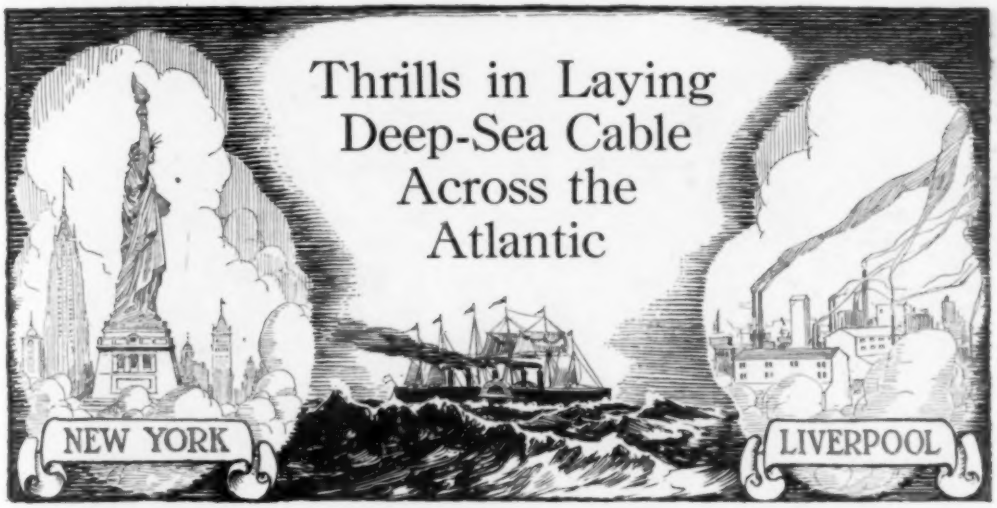
In certain western towns, parking regulations are not applied to visiting motorists. To save themselves the embarrassment of arrest and a trip to the police station, out-of-town drivers attach aluminum tags to their automobiles, bearing the names of their home cities. Traffic officers are instructed not to include such cars under the rules that apply to the local machines.

Visitors' Tag on Automobile that Marks Occupants as Privileged Guests of a Town

COAL TAR MAY HOLD REMEDY TO COMBAT LEPROSY

Scientists are studying a reported remedy for leprosy, said to be made from a coal-tar extract. Its discoverer, a Javanese doctor, believes that it will give permanent relief from the disease. Already a halt has been called in planting of chaulmoogra trees, which yield an oil said to be the most successful treatment now employed. Many victims who have taken the treatment have had relapses, but are regarded as "arrested" cases and no longer as menaces to their communities.

Landing the Cable from Ship's Cutter: So Great Was the Joy of One of the Workers when an Early Cable Was Brought Ashore, that He Fell on His Knees and Kissed It



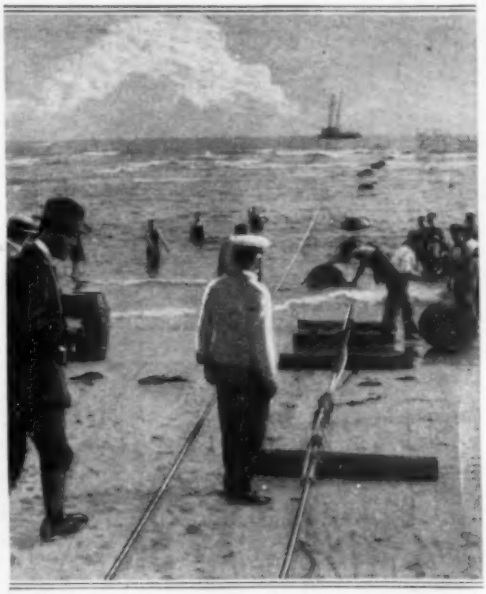
Thrills in Laying Deep-Sea Cable Across the Atlantic

WHILE, 57 years ago the world noted the fact that the steamship "Great Eastern" had completed its memorable work of connecting America with Europe by the first successful Atlantic telegraphic cable, the recent landing on the south shore of Long Island of a new line of communication attracted little attention.

Nevertheless, this latest undertaking marked the closer binding together of the New World and the Old, for, despite the advent of the wireless and the establishment of powerful radio stations, which are capable of spanning vast terrestrial distances, the fact remains that this newer method of electrical intercourse has not scrapped the older order of long-range telegraphy.

Traffic over the submarine cables linking North America with Europe has increased fourfold in the last decade, and yet, until recently, nothing has been done within that period to add to these undersea nerves of communication. The cost of the new cable, representing the present height of scientific knowledge concerning such things, has been put at $15,000,000; and to get it properly in place on the sea bed has required the service of specially constructed craft manned largely by a crew trained for that hazardous and extremely exacting work.

Few persons realize what painstaking skill is required in building a submarine cable properly insulated and duly armored with a wrapping of steel wires, strong enough to withstand the rub of a rocky bottom and the continual sweep of tidal currents. Not only that, but this conduit, by which the feeble electrical impulses carry the daily heartbeats of national life from shore to shore, must be proof against the penetrating persistence of deep-sea worms, and sufficiently sturdy to hold its own against attack of swordfish and other large denizens of the ocean. Should it break or be severed, when once in place, the task of picking up the parted sections, or of raising the defective cable at the right point, may require grappling for it miles below the surface and sweeping wide areas of the sea. In short, the story of cable-laying is an epic well calculated to hold one spellbound.



Hauling Shore End of Cable through the Surf and onto the Beach from a Distant Ship

Pouring Concrete over the Shore End of the Cable and Its Guides to Hold Them Permanently to Their Moorings and to Protect Them from the Pounding Surf

Life aboard a cable-laying vessel is filled with excitement. Off the coast of Spain, recently, two tons of oysters were hauled on board an Eastern Telegraph Company boat, when a cable was pulled up for mending and had to be hacked off before the repair could be effected. Again, in the Gulf of Suez, a cable was brought up coiled around the body of a small whale. Sponges, coral, old fishing nets, and all sorts of shells are brought to the surface, and the refuse of civilization, washed down the rivers into the sea, has been picked up as far as 500 miles from land.

Between about 1845 (when gutta-percha made submarine telegraphy a practical possibility) and the middle '70's (when cables became part of the ordinary routine of civilization), tremendous excitement was aroused by every new attempt to establish such communications across the ocean. The first cable between Dover and Cape Grisnez amused the mid-Victorian loafers on the beach, for they thought the thing was to be worked like a bell pull and tugged from either coast of the English Channel. That was in 1850.

People soon grew better informed and

wildly enthusiastic. Even the cable laid during the Crimean war between Varna and Balaklava—an unheard-of distance, 356 miles—although it failed to work, was hailed as a signpost of progress. The 1856 Atlantic cable began from western Ireland, under the eyes of the Lord Lieutenant, while prayers were offered from the beach for its success. The current, nevertheless, stopped mysteriously at intervals, and finally halted altogether. In the next year communication with America was kept up for only a month. Soon after this there was a pause, while a commission sat to examine the whole question. Over this early adventure three to four millions had been lost.

The commission reported that, despite its discouraging and expensive past, submarine telegraphy had an infinite future. Encouraged by this, the believers in progress watched the "Great Eastern" with confidence. The ship lost the 1865 cable while paying it out. But in 1866 it triumphed. After this the cables were woven very swiftly into a network that covered all the seas of the world. So great was the excitement, that during the landing of an early Atlantic cable at Heart's Content, Newfoundland, one of the workers fell on his knees and kissed it.

The men primarily responsible for linking the Old World with the New were Cyrus W. Field and Samuel Morse. When the latter announced in 1857 that messages could be sent from America to Europe through means of thin strands of wire stretched along the ocean's bed, the people of the day hooted. Morse had shown the world the wonders of telegraphy a short time before and had flashed to Alfred Vail, his co-worker, that epoch-making message, "What hath God wrought!" That happened May 24, 1844, and came after he had faced discouragement and rebuffs that would have driven an ordinary man mad.

Came 1857, and Field, a New York merchant, Morse, and a group of associates, decided that a transatlantic cable would not be an impossibility. Interest in the venture became intense and on Aug. 7, 1857, the ship "Niagara" left Valentia Bay, Ireland, with its rolls of cable. Four days later the brakes on the cable-laying apparatus were put on, while the stern of the boat was down in a swell. The cable parted, thus ending the venture for that year.

"We knew it!" croaked the scoffers on each side of the water. "The whole thing is a humbug. Did those men think we would swallow everything they said?"

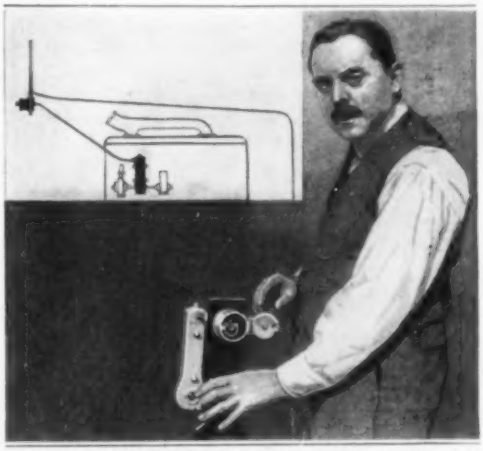
Another attempt in 1858, which also failed, brought a wave of comment from all over the United States and Europe. Newspapers were unanimous in pointing out a hundred reasons why a cable never could be laid, and in sympathizing with those who had sunk their money in it. Three other unsuccessful attempts followed, victory not greeting the efforts until 1866.

BAKERY GENERATES OWN GAS TO HEAT LARGE OVENS

By producing gas from coal in its own yard, a large Copenhagen, Denmark, bakery has brought about a saving of twenty-five per cent in fuel and, in addition, has done away with harmful soot and smoke. Its 16 ovens, in use every day, are found to be more uniformly heated, resulting in better baking. From the generating plant, which has been patented by the designer, the vapor is piped into each unit, the flow being regulated by special valves, so that an even temperature is maintained.

ALARM SET ON AUTO SOUNDS IF THIEF STARTS MOTOR

Sounding a loud rattle to attract attention when the motor is started while it is set, a combination alarm and keyless lock for automobiles helps to prevent theft. As long as the engine runs, the device sends out the warning, which can be heard above the din of traffic. It can be either shut off or fixed so that it will work when the car is left unguarded. The device is connected to a specially designed noise-maker in the crankshaft.



Auto-Thief Alarm, Connected with Crankshaft, that Sounds Loud Rattle when Engine Is Started

Unusual Footbridge Made of Chicken Wire and Planks

FOOTBRIDGE OF CHICKEN WIRE REPLACED BY CONCRETE

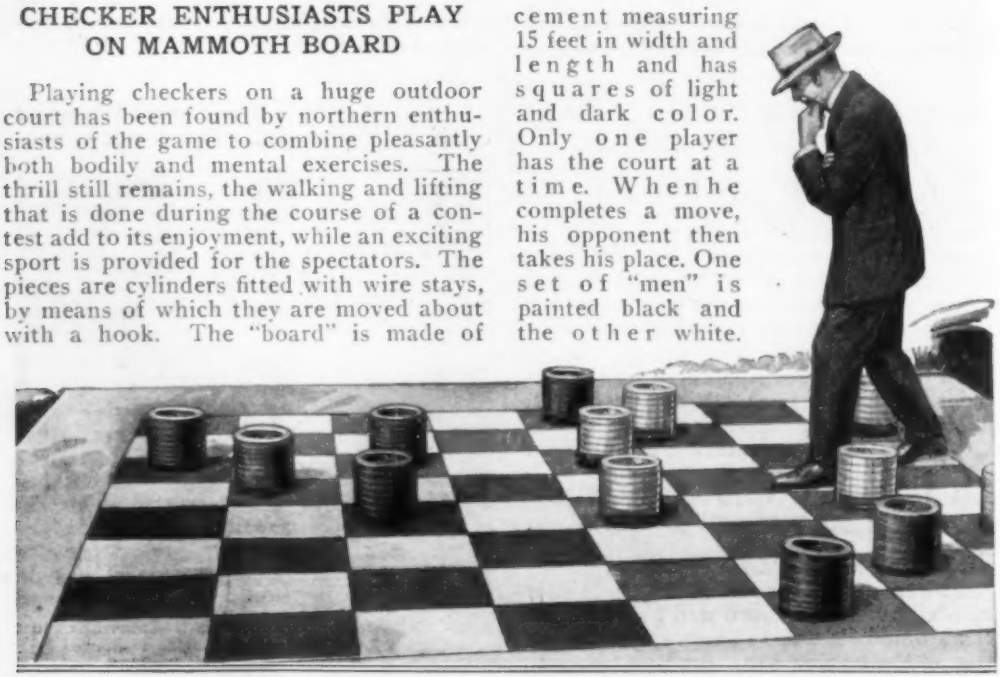
Made of chicken wire with a floor of planks, a picturesque footbridge that spans a western river is soon to be torn down to make room for a modern concrete structure. The improvised bridge is of a suspension type and the central section, more than 300 feet in length, swings high above the water. On account of the swaying of the structure whenever an adventurous person steps upon it, high sides of poultry netting have been made to keep the walker from falling into the river.

DIES AND ACIDS DRAW "INVISIBLE" WIRES

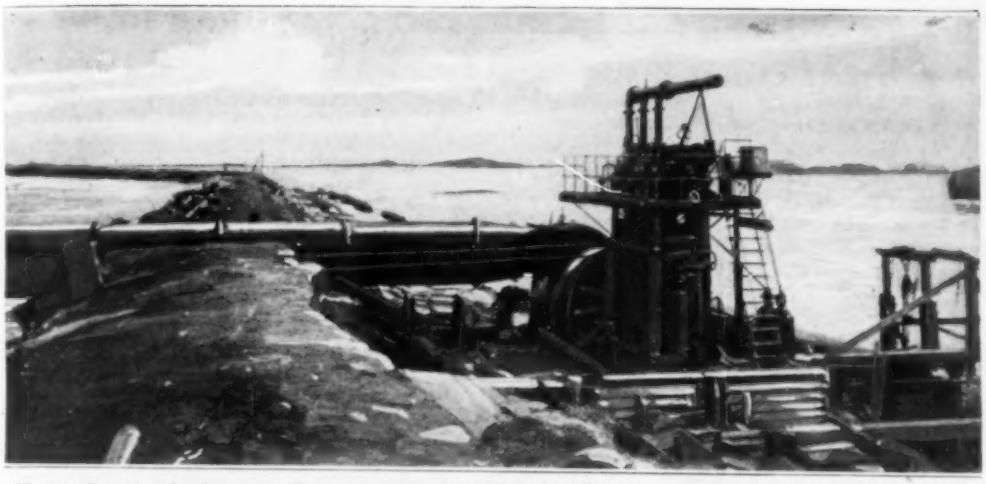
Drawn into strands as fine as 200 millionths of an inch in diameter, wires that are invisible to the unaided eyes are used in minute electric bulbs, necessary to the operation of long-distance telephone lines. So thin are these metal threads that it is necessary to weld them under a microscope. After passing through dies, the filaments are eaten down to the required size by acid. One hundred of them form a strand no larger than a hair.

CHECKER ENTHUSIASTS PLAY ON MAMMOTH BOARD

Playing checkers on a huge outdoor court has been found by northern enthusiasts of the game to combine pleasantly both bodily and mental exercises. The thrill still remains, the walking and lifting that is done during the course of a contest add to its enjoyment, while an exciting sport is provided for the spectators. The pieces are cylinders fitted with wire stays, by means of which they are moved about with a hook. The "board" is made of cement measuring 15 feet in width and length and has squares of light and dark color. Only one player has the court at a time. When he completes a move, his opponent then takes his place. One set of "men" is painted black and the other white.



On Huge Court of Cement, Marked with the Required Number of Squares Game of Checkers Is Adapted to Outdoor Playing, Providing Both Mental and Physical Exercise



Electric Pumping Station of the Type that Is Rapidly Displacing Picturesque Windmills Behind Holland's Dikes

WINDMILLS OF HOLLAND GIVE WAY TO OIL ENGINES

MODERN machinery is taking the place of romantic windmills that long have guarded the dikes of Holland against the encroachment of water. Fuel-burning engines have fast supplanted the quaint winged structures, until now even the pumps are run by motor when the wind fails. With the coming of up-to-date equipment, the typical Dutch panorama has been greatly transformed by the chimney stacks of the pumping works. Everywhere along the lowlands these are to be seen. As a result, the engineers are facing a problem—that of retaining the beauty of the landscape that received its most picturesque touch from the windmills. Already steps have been taken to beautify the modern plants, for it is feared that the capital value of Holland's scenery will be materially decreased unless belching smokestacks and machinery are concealed in structures pleasing to tourists' eyes. Part of the country is below sea level, and for centuries the farmers have been waging a battle against the sea. It was to this work that the windmill was first adapted in the beginning of the 15th century. Now the task is largely done by oil, steam, or electrically driven pumps. Some of them are huge. One of the largest of such stations serves 45,000 acres, removing 100,000,000 tons of water annually. Powerful equipment such as this, seems to have increased the activities in reclaiming land from the sea. But in the many such ventures that are now under way, the windmill has no part, for the passing of time has rendered it useless, except on small farms.

Photos Courtesy Oil Engine Power

Where the Wind Works for Prosperity of Lowland Farmers

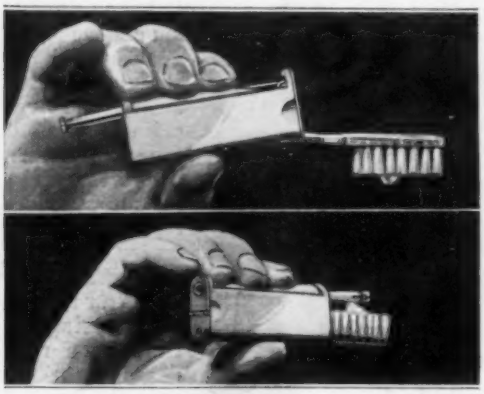
HARVESTING SALT CROP FROM NATURAL BEDS

From deposits in California, 20,000 tons of salt are harvested annually as part of the country's yearly output of this mineral. As to when rock-salt formations were first found, history does not say, for not until 1000 A. D. was its mining mentioned. Probably the most famous salt mines are in Galicia, where the worked-out rooms have been decorated and converted into chapels and assembly halls by the miners. In these workings there are underground brine lakes upon which small ferryboats run, railways with stations, and other conveniences found in large cities. It is claimed that these pits were once the property of the Romans. The oldest salt mine in the United States is said to be located in Louisiana, where thousands of tons have been removed since it started operation. Here it lies in a solid mass over 2,000 feet thick, in which a series of chambers have been dug, arranged like the squares of a checkerboard, with arched roofs supported by pillars of salt. The rooms are 70 to 80 feet high. Another method of procuring the mineral from the earth is by drilling wells, and in many places there are huge surface beds that have been formed by evaporation of large bodies of water. For centuries salt has been made by using the sun as a heat source, but this method is practicable only where there are few cloudy days.

Lump of Rock-Salt Crystals Taken from Vats After Moisture Has Passed off

COMBINED BRUSH AND TOOTH-PASTE HOLDER

Designed to at once insure freedom from dirt and save space, a combined toothbrush and paste holder has been placed on the market, the invention of an easterner. The brush and handle fold up so that the article is less than two inches in length, which makes it of special value to travelers, who may carry it in their vest pocket or traveling bag. The dentifrice may be applied without removing the tube from the container. Sanitation is provided for, in that the brush is not exposed to the air when the device is folded.

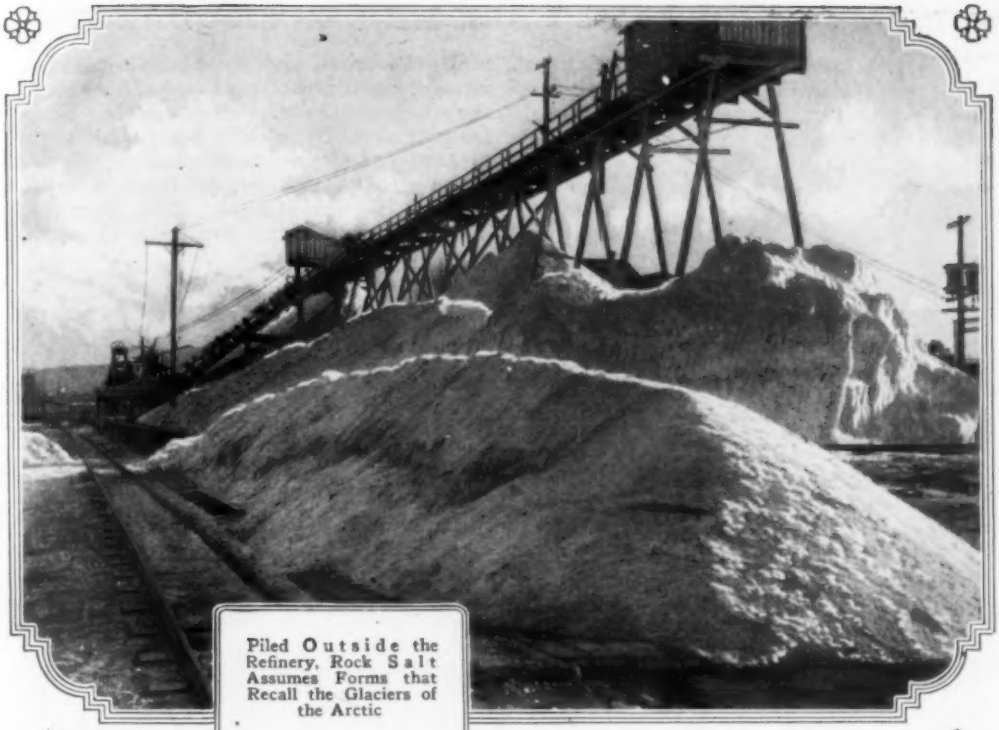


Tooth Brush and Paste Combined in Small Holder that Saves Space and Insures Cleanliness

MOTOR-DRIVEN ERASER SAVES LOSS IN PRINTING

On a job of 200,000 postcards, an eastern printer discovered a small error that seemed to necessitate the destruction of the lot. Instead he rigged a motor-driven eraser which was applied to the postcard over an opening in a brass sheet and completely removed the objectionable part. The cards were then reprinted according to the correct copy.

¶ Quintana Roo, Mexico's unexplored territory, lying adjacent to Yucatan, is being invaded by Americans, the first white occupation since the days of Cortez.



Piled Outside the Refinery, Rock Salt Assumes Forms that Recall the Glaciers of the Arctic

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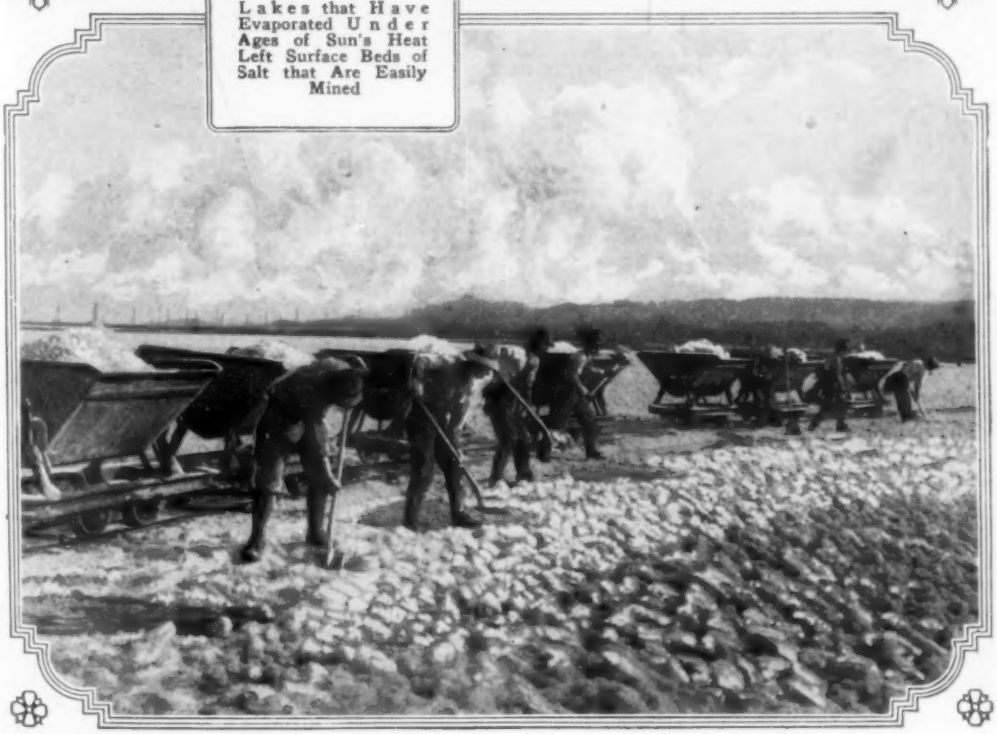
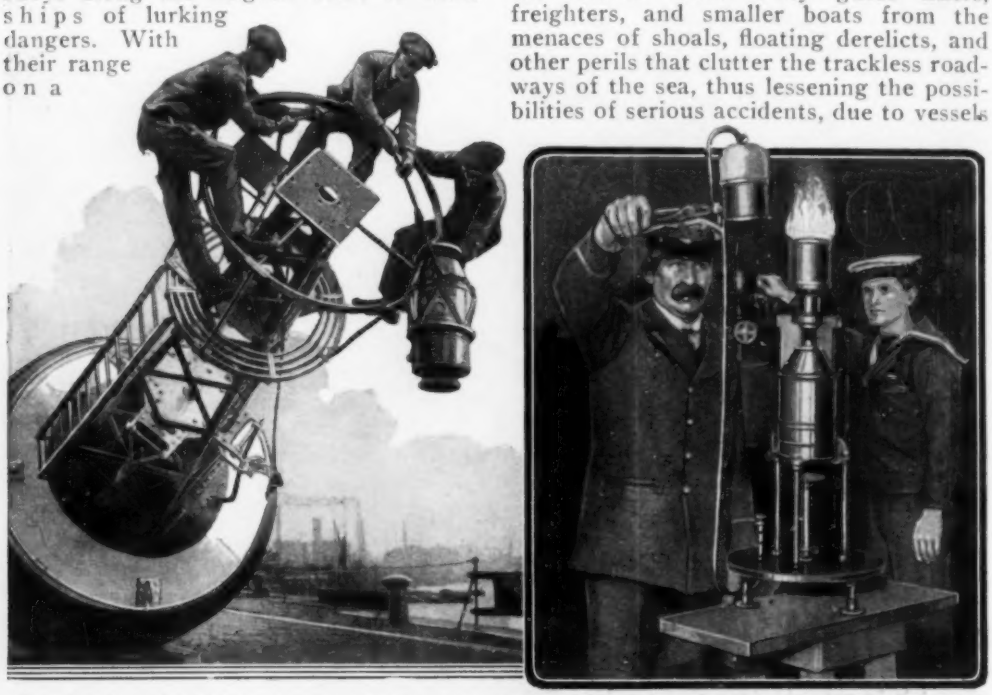
Lakes that Have Evaporated Under Ages of Sun's Heat Left Surface Beds of Salt that Are Easily Mined



OIL-VAPOR LIGHTS TO MARK HIDDEN SEA DANGERS

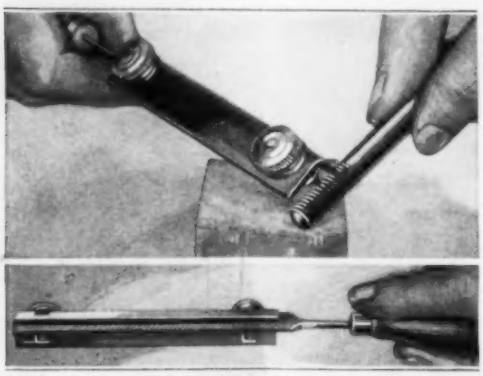
Oil-vapor lamps, said to be twice as bright as paraffin lights, have been put on buoys along the English coast to warn ships of lurking dangers. With their range on a clear night limited only by the earth's curvature, these signals are reported to make the ocean highways brighter for the numerous craft that ply the waters around the British Isles. They guide liners, freighters, and smaller boats from the menaces of shoals, floating derelicts, and other perils that clutter the trackless roadways of the sea, thus lessening the possibilities of serious accidents, due to vessels wandering from the safe paths of travel during hazy weather or extreme darkness.



Attaching Powerful Oil-Vapor Lamp to Sea Buoy. One of Many that Guide Ships along English Coast at Night: Right, Regulating Light before Installing It

HAND TOOL RETHREADS SCREWS THAT ARE BADLY WORN

For rethreading screws that are badly worn, a hand tool that cuts from eight to sixty threads an inch on any diameter, has been invented in England. It consists of a specially designed file that is fitted to a guide by adjustable clamps. The "V"-shaped edges fit the screws for recutting.



Tool that Rethreads Badly Worn Screws by Hand Cutting Brought Out in England

SKULLS EXPLODE SCIENTISTS' THEORY ON INDIANS

That Indians resembling prehistoric man resided on the Pacific coast at an age many centuries earlier than heretofore known, is now claimed by scientists as a result of the recent finding of two skulls. Digging in a mound, upon the site of an early home of the Santa Barbara tribe, the explorers found the relics, which are believed the oldest ever unearthed on this continent. They were lying on the surface of hard pan 44 inches beneath an age-old deposit of loam which showed no traces of having been disturbed previously. Almost gorillalike, the skulls are very thick, with

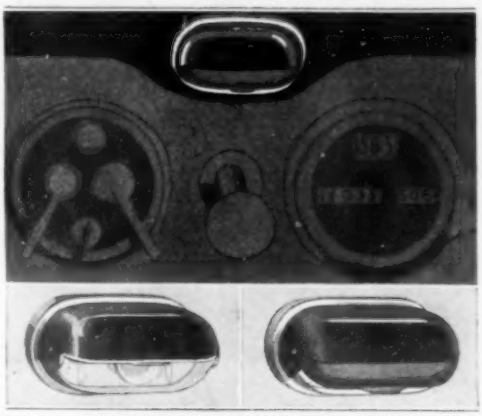
abnormally prominent brow ridges, sharply retreating foreheads, long faces and massive jaws. Beside each skeleton was found a black volcanic-stone spearhead, one of which was 4½ inches long and 1⅝ inches wide, and square ended.

FIVE SIZES OF STONES SORTED BY DANISH MACHINE

With a capacity of 800 tons daily, a modern mechanically operated plant in Denmark crushes and sorts stones into five sizes for the national railroads. The machine automatically discharges into cars.

DASH LIGHT FOR AUTOMOBILE HAS ADJUSTABLE SHADE

Annoying glares from ordinary lights on the instrument board of an automobile are absent in a shaded dash lamp that has been lately patented. When the shutter is in normal position, subdued rays fall on all the dials and the entire board is under a flood of light that does not tire the eyes or impair the driver's vision. A slight movement of the shade gives sufficient illumination to enable the autoist to read his watch or maps, find tools, or inspect the battery. It can be attached in a few minutes to any size car and its simple construction is intended to insure correct operation at all times. Made of brass or bronze, its socket is formed so as to keep the bulbs from sticking.



Adjustable Shade Dash Lamp that Lights Up Instrument Board without Producing Annoying Glares

¶ From an 8-ounce package of Sudan grass seed sent to this country from Khartum in 1909, what is now a $10,000,000 forage crop has been produced in the West.

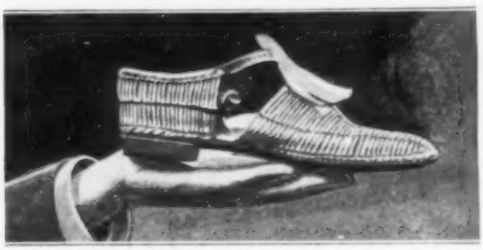
MOWER HITCHED TO TROLLEY CAR TO CUT WEEDS

Hitched to the rear end of a trolley car, a mower is used by a middle-western traction company to cut weeds and grass along its right of way. The machine has a long sickle that can be raised or lowered at will to prevent striking obstructions that may lie in its path. It rides the track on flanged wheels. With one man operating the machine, work formerly requiring many laborers is accomplished in a few hours.

Mower, Pulled over Rails by Trolley Car, Cuts Weeds Growing along Right of Way

OPEN SANDALS ARE ADVISED IN WAR ON HIGH HEELS

As a correct substitute for high-heel pumps, which he considers are destructive to the general health of women and the beauty of their feet, open-work leather sandals have been offered by a famous English surgeon. These shoes, he asserts, are more comfortable, promote bodily vigor, and do not cause spinal and nervous disorders which may result from wearing those that have elevated arches and heels.



Sandals of Open-Work Leather that Are Recommended by Surgeon as Proper Shoes for Health

CAGELESS DEN IN ZOO IS BUILT FOR KING OF BEASTS

Covering the side of a canyon, a unique concrete grotto for lions has been constructed at the San Diego, Calif., zoo. To all appearances, the three animals kept there wander at will over a terraced hillside, with apparently only a three-foot hedge of cactus to restrain them from joining the audience. In reality, a wide moat, concealed by the hedge, provides safety for the spectators.

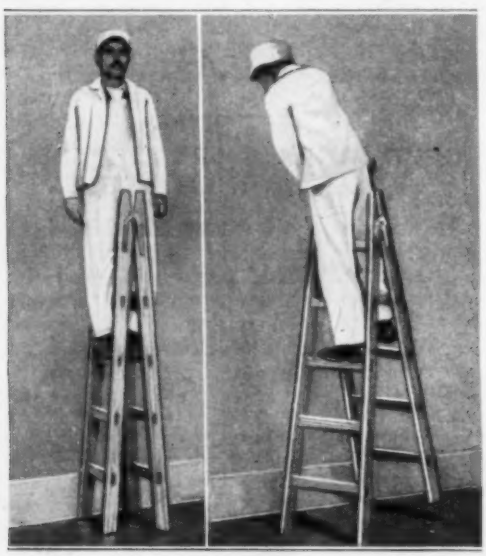
Here, there is no small and confined cage which invariably challenges sympathy for the animals, nor are there the usual heavy iron bars to interrupt the view. And yet, there is no point where it would not require a 16-foot leap for the king of beasts to escape. The top walls are built with an interior overhang.

Another notable departure in zoo spectacles has been staged in London, where the tribal wars of many colonies of ants are being shown. The tiny creatures are placed on a tablelike platform, and large magnifying glasses are available, through which the wonderful performances may be watched. After one notable battle between the ant forces, the victors could be seen taking their prisoners of war and the spoils—such as building material and food—back to their own colony.

One of the newest and most modern of European zoological gardens is at Rome. Rock-ribbed inclosures and other installations permit the animals to be seen practically in their natural habitats. One of the features is the aquarium, where tanks of fish are kept to be fed to the fish-eating birds, which are allowed to dive down and help themselves, instead of having their food thrown to them.

"WALKING" STEPLADDER MOVED BY USER AS HE WORKS

By throwing the weight of his body from side to side, a workman using a late type of stepladder is enabled to move it to a new position without descending. The two sections of the ladder are hinged together at the top in a rather loose connection which permits easy operation. The upper ends of each part of the ladder are offset, thus permitting the swinging action referred to.



Stepladder So Designed as to Permit User to Move It About as Though on Stilts

BICYCLE IS BOON TO VICTIMS OF JAPANESE EARTHQUAKE

Thousands of Japanese on bicycles pedaled their ways through wrecked streets, seeking safety and aid after the recent earthquake. Motor cars, trucks, and jinrikishas were useless in most sections of the country. Soon after the disaster, a bank clerk is reported to have carried an important message from Tokyo to Kobe, a distance of 300 miles, in 34 hours, riding his bicycle over roads made impassable to other vehicles. It is estimated that more than 3,000,000 bicycles are used by natives throughout those islands.

SHEET TIN AROUND TREE LIMBS DEFIES SQUIRRELS

Sheet tin, wrapped around the upper limbs of almond trees in a western orchard, keeps ground squirrels from climbing over the branches to get the nuts. Damage formerly done to a crop near old pasture land led to the invention of this simple method. Shaped like a stovepipe and put on close to the bark, the protection cannot be crossed by the little animals, because of its smooth, glassy surface.

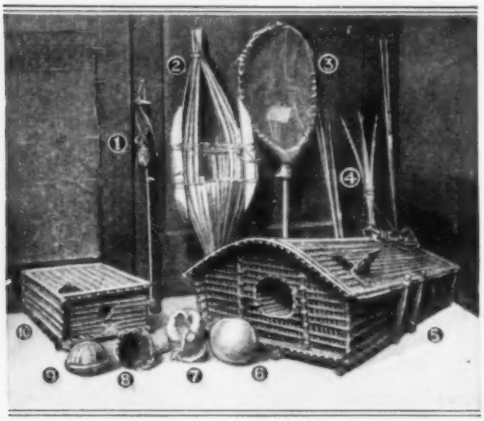
Something of the Lion's Native Haunts Is Seen in Terraced Approaches of the Zoo Cave

High Unscalable Walls Replace Iron Bars and Bare Cages that Restrain Most Captive Animals

With Freedom Only Surpassed in Its Natural State Young King of Beasts Romp in the Cageless Den

Trapping Strange Fishes in South Seas

SO varied are the forms of fishes inhabiting the waters surrounding the South Sea Islands, that myriads of different traps, nets, hooks, and spears are used by the natives to catch them. As the peoples of this region depend largely on the sea for food, these queer implements are an important part of their every-day life.



Photos Courtesy Frank Burnett

Ingenious Traps for Ensnaring Fish—Number 1, Float for Hooks, Solomon Islands; 2, 5, 6, 7, 8, 9, and 10, Traps Made by Natives of Washington and Ellice Islands; 3, Hand Net for Catching Palolo Worm; 4, Spears; 6, Parrot Fish, Inflated and Dried

In the Gilbert Islands, the natives go out in frail canoes alongside of the reefs, where the sharks are usually found, and with large baited hooks catch the monsters from three to fifteen feet long. Balancing upright in their boats the hunters, with an ability few white men can equal, play the huge captives until they are sufficiently weak from exhaustion to be drawn alongside and clubbed to death.

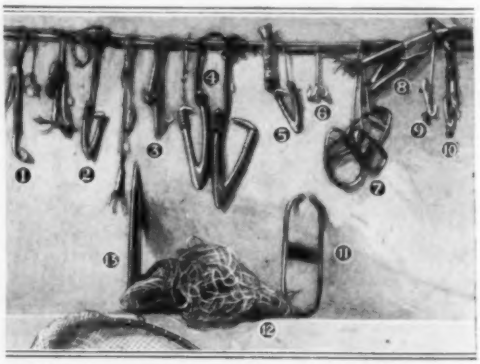
Sometimes the boat is capsized in the struggle and the agile native finds himself in the sea on an even plane with his vicious antagonist. But even then, if armed with a knife, the angler is equal to almost any shark. If the enemy charges, the swimmer, awaiting the right moment, dives under the quarry and in a flash rips it up the soft underside of the body.

Beautifully wrought hooks of pearl shell dangle at the ends of lines used by these fishermen to troll for albacore, bonito, sea pike, and corphœna, fish that are seldom heard of in the civilized quarters of the world. Still other models of hooks and fishing gear are to be seen among the weapons of the New Guinea angler, and many different kinds of barbs and spears provide the Samoans, Ellice Islanders, and tribes of the Solomon Island group with a means of livelihood.

A peculiar fact is that peoples of vastly different races and colors who never by any chance could have known each others' ways, fashion their fishing tackle very much alike. The same hook by which the Gilbert Islander catches his shark is almost identical with that used by the cod fishers of British Columbia. Implements used in making nets in the Solomon Islands bear a remarkable resemblance to that employed by the crofter of northern Scotland.

In the Washington Islands, square traps are set to take the wily denizens of the ocean. They are built of bamboo held together by coir string made from the husk of the coconut. One of these is used particularly for the castor-oil fish, which lives at a depth of a hundred fathoms, and another ensnares the conger eel. Both fishes are highly prized as food.

A crab net used by some of the other islanders has a bottom piece made from a giant clam shell, which in these waters sometimes attains the enormous weight of a ton or more. As the net is lowered into position, the shell sinks to the bottom of the sea and automatically opens the mouth of the trap. When a crab enters, the fisherman who can see clearly in the water to great depths, pulls the mouth closed.



Fish Hooks and Netting Needles of South Seas—Number 1, Hook Used in New Guinea; 2 and 4, Shark Hooks of Gilbert Islanders; 3, Samoan Hook; 5, Ellice Islanders' Hook; 6, Hook Made by Solomon Islander; 7 and 8, Cod Hooks of British Columbia; 9 and 10, Hooks Carved from Pearl Shell; 11 and 13, Weaving Needles for Making Net Shown at 12

Another peculiar net is that used to catch the mysterious palolo, a strange oceanic worm which comes to the surface only on one day of the year, and is considered to be a rare tidbit on the feast table. Com-

ing up from the reefs below during the night, it dissolves into small particles shortly after the sun rises. Each of the tiny pieces becomes the beginning of a new worm. The natives, who claim that they can tell the exact hour of the day that the creature will reach the top of the water, often catch huge quantities of the worm before it can break up and sink again.

In the Solomon group, the fishermen resort to a float to which is attached a number of hooks. When the prey takes the bait, it causes a little ball that stays on top of the water to move. The float is made large and buoyant enough to take quite a large-sized fish.

Perhaps the rarest of all those of the tropical waters is the queer parrot fish. When it is drawn out of the water it swells with fear and anger, and assumes an appearance much like a globe.

MOTH HELPS PLANTS INCREASE SO LARVÆ CAN GET FOOD

To insure a proper food supply for her future larvæ, the little white moth acts as a foster-mother to the yucca plant, helping the weed to increase by bearing seed from one flower to another. After laying an egg in the pollen, the insect rams it down into the pistil so that it will fertilize, and thus maintain life for her young ones. The process is so cleverly effected that scientists say man cannot equal it, as artificial attempts are rarely successful. The plant is said to be the only one that depends on a single species of insect for this service.

PHONE RECEIVER HELD TO EAR BY BRACKET; FREES HANDS

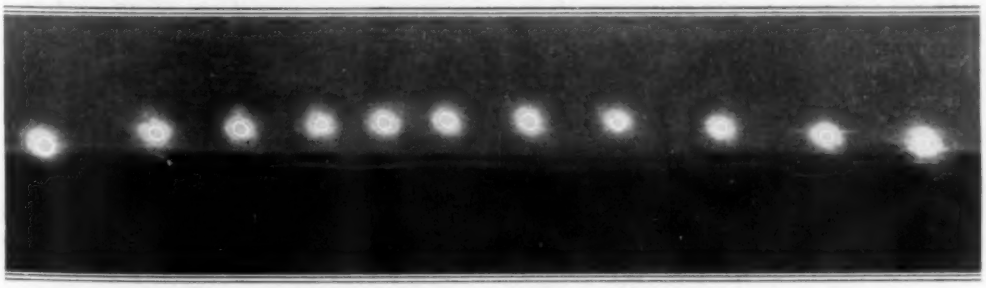
Free use of both hands is permitted a person using a telephone equipped with a folding steel arm recently invented, that

Holder for Telephone Receiver that Permits Free Use of Both Hands while Talking

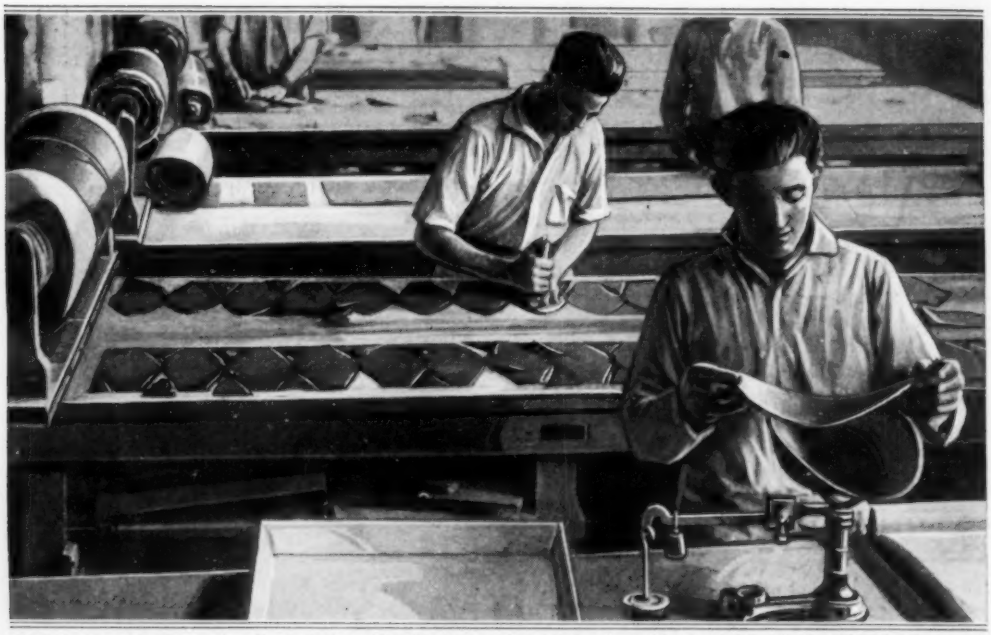
holds the receiver to the ear. Clamped to the stand, it is easily adjusted to any position desired. With a single movement of the arm, the receiver hook is raised to signal the operator. To disconnect, the holder is folded back. Its weight is counterbalanced by a plate fitted under the telephone.

CAMERA "SEES" SUN'S COURSE IN POLAR DAY

In obtaining a photograph showing the exact course of the sun in the far North on December 21st, the shortest day of the year, a prospector made several exposures on the same plate, one every 12 minutes from the top of a high mountain peak in Alaska. Only two hours passed between sunrise and sunset. The first picture was taken at 11 a. m., when the sun appeared on the horizon, and at 1 p. m., as the flaming planet started to drop from sight, the last of the series was snapped. During this time the camera was not moved from its fixed position.



Sun's Course on Shortest Day of Year Photographed from Point in Arctic Circle



Only Expert Workmen Are Permitted to Mix the Proportions of Crude Rubber and Chemicals which Are Formed into Sheets for the Fabrication of Heavy Vehicle Treads

Jungle to Factory—Trail of Auto Tire

Sidewalk from Chicago to New York Could Be Built from Rubber Annually Consumed in Making Treads and Tubes

ABOUT seven-tenths of the value of rubber products made in the United States is represented in automobile tires and inner tubes, while 75 per cent of the world's entire output of the material is consumed in their manufacture.

Until recent years the "rubber trail" took its traders into the wildest lands of the tropics, where they confronted untold hardships in order to provide the motorist with velvet shoes for the wheels of his car. Now, the rapid production of rubber on cultivated plantations makes the collecting of the various grades a far easier task.

In the Far East and countries about the equator, great orchards of Para trees have been planted under the direction of Europeans, but lately many American rubber manufacturers have developed their own plantations in these lands. Instead of the ungraded mixed shipments, which formerly came up from the headquarters of the collectors of "wild" rubber, each variety is now carefully selected at the time it is drained from the trees. Kept separate from the other grades, it reaches the market or factory in clean condition, ready for the process of refining for its various purposes.

This cultivation of the rubber trees has forced the "wild" product almost entirely from the markets, although about 40,000 tons are still bought up each year. Seed from the Para tree, the plant which furnishes the sticky fluid, was first planted in a public garden in London in 1876, where it thrived and grew to normal size. Following this experiment, seedlings from it were carried to southern India, Sumatra, Java, and neighboring states. The first crop that resulted from these early plantations produced not much more than four tons of raw rubber.

Seven years later the output had grown to 1,000 tons and in another decade reached 200,000 tons. The cultivated article now constitutes a supply of rubber that helps to make more than forty million tires required by the pleasure and commercial motor-driven vehicles in operation in this country alone. If in one mass, it could form a sidewalk from Chicago to New York.

It takes eight and three-tenths pounds

Native Workers on a Rubber Plantation in India Gathering Sticky Sap of the Para Tree

Vulcanizing Room of an Automobile Tire Factory where Casings Are Cured After Being Built Up of Raw Rubber

of the raw substance to make one of the average tires, and about two pounds for an inner tube. For the casing, four and a half pounds of cotton are also required.

Plantation rubber when brought to the factories is stored away in cool bins until needed, but the "wild" variety is chopped into small pieces and soaked in warm water to soften it. It is then passed into a "cracker" machine where rolls with sharp knobs break it up into a coarse, spongy mass. Water flowing over it washes out the sand, dirt, bits of bark, and other foreign substances that get into it during its preliminary treatment at the hands of the jungle gatherers. After drying, the rubber is mixed with other materials and becomes the uncured or "green" compound.

An added step in the trail of the rubber from the jungle to the factory has been lately taken by one large manufacturing plant, which loads the milky fluid, called latex, into tank boats as it is gathered, and thus conducts it directly to the treating rooms. There it is pumped into large vats, and is sprayed by a recently invented machine into a heated chamber where it becomes a spongy mass deposited on the moving floor of the room, quite free from dirt frequently found in baled rubber.

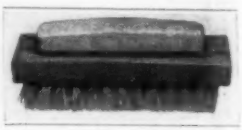
SCULPTOR'S ART MODELS COW FROM BLOCK OF BUTTER

Modeled in butter, the figure of a dairy cow, weighing 375 pounds, graced an exhibit at a fair held in the South, recently. In shaping the "statue," the sculptor's chisels and hammers were replaced by knives and other light pointed tools. Unlike the marble variety of such objects of art, in case a bad stroke was made, the damage could be easily repaired without leaving any evidence of it. While the artist plied his craft, the subject was kept in a cold place so that the material would not become soft. The interior of the case in which it was shown, also had to be kept at a low temperature during the exhibition.

Figure of Dairy Cow Modeled by Sculptor from Block of Butter for Southern Exhibit

INVENTOR COMBINES HAND BRUSH AND PUMICE

Vigorous and often painful scrubbing of the hands with a brush of coarse bristles may be avoided by the use of a device placed on the market by a middle-western inventor, which combines the hand brush with a piece of pumice stone. The latter is inserted in the back of the brush, and provides an easy means of cleansing the skin. The combination is also offered manicurists who constantly use pumice to clean the hands of their patrons.



STREET-CAR WIRES DISTURB TELEGRAPH CABLE

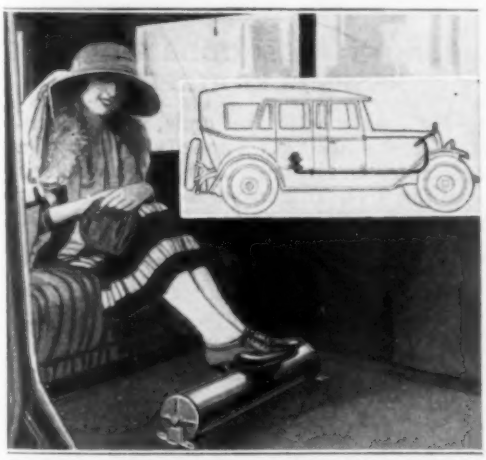
Disturbances, due to the corroding effect of electricity that found its way from a near-by trolley wire, caused trouble with the submarine telegraph cable in South Africa, according to a recent report. When the recorder showed signs of disorder, the cable was examined and discovered to be corroded for a distance of a mile where it ran parallel to a street-car line, a half mile distant. To offset this a dummy cable with an earth plate was placed as nearly as possible over the old conduit. Tramways in London have seriously affected the earth's magnetic field around Greenwich, where all British compasses are corrected, and the laboratories were forced to move several miles from any electric line. In the United States a number of magnetic observatories have been disturbed by near-by trolleys.

SKULLS OF EARLY AFRICAN MEN MAY REVEAL NEW RACE

Finding of two skulls in southern Africa may bring to light an unknown race of giant men that once dwelt on the southern tip of the Dark Continent. They were dug up in a cave, several feet below the remains of other primitive men of a later date, indicating to scientists that the cavern was occupied by at least two different peoples, one much lower in civilization than the other. Hitherto the earliest known inhabitants of that section were the "shore-runners." Over the near-by country, particularly along the rivers, specimens of chipped stone were discovered, but no trace of those who had worked them.

HOT-WATER HEAT FOR AUTOS PIPED FROM RADIATOR

Clean, odorless heat for inclosed automobiles is provided by an easily attached valve that makes use of the hot water from the car's radiator instead of the exhaust



Heater that Warms Interior of Automobile with Heat from Hot Water of Radiator

gases. This not only keeps the interior of the car at an even temperature, but helps to control the heat of the motor, assuring easier starting and smoother operation. Also, it eliminates noise, carbon, and soot. It is said that the system provides heat within four minutes after the motor is started and keeps it up at any speed.

¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

HARD HAT PROTECTS WORKERS FROM HEAD INJURIES

Workers, such as miners, steel erectors, and ship builders, can protect themselves from serious head injuries resulting from

Wearing Hard Hats, These Two Workmen Escaped Possible Serious Injury from Falling Objects

falling objects by wearing a hard cap now being marketed in the West. Light and comfortable, it is said to be a nonconductor of electricity, and proof against fire and water. A shipyard laborer wearing one of the guards was struck on the head by a 12½-pound piece of steel which fell six feet. He was knocked to his knees, but was uninjured. Another, provided with the cap, was struck down by the impact of a 20-ounce bolt falling 42 feet. He was not hurt, nor was the headpiece broken. For those who labor in poorly lighted places, the article is a safeguard against accidents due to contact with low ceilings and overhead projections.

COLUMN GUIDE FOR LEDGERS TO HELP BOOKKEEPERS

To reduce the possibility of errors by bookkeepers, when posting entries in ledgers, a column guide has been recently patented that directs the worker's eye to the proper line for individual groups of figures. It also saves time by making repeated references to the top of the page to find the

Ledger Guide for Bookkeepers Enables Them Easily to Locate Proper Spaces for Entries

proper division unnecessary. Backed with a strip of absorbent paper it eliminates need of reaching around for a blotter when a line of ink is to be dried. The cardboard guide is protected by a transparent cover.

Completed Bust of Abraham Lincoln, and Beside It the Small Model which Guided the Sculptor

TINY MODEL GUIDES SCULPTOR IN FIFTEEN-YEAR TASK

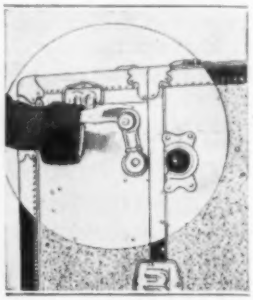
Representing a task that will take him 15 years to complete, a model of the New York war memorial was recently made by an American sculptor, who was commissioned to do the work. Following this design, the artist will chisel the subject in stone. Some idea of the difference in size between the model and the finished monument may be gained by noting the size of the figure which was used in creating a sculptored bust of Abraham Lincoln.

STUDY SOUND BY RECORDING REVERSED SPEECH

Reversing ordinary conversation may be an aid in the study of sound. In connection with this research, a device has been invented that reproduces sounds either in correct or inverted order. Impressed upon a ribbon of steel, spoken letters are repeated in their right form if the wire is run in the same direction as that in which it moved when the original record was made. If it unwinds in the opposite way, the sounds are changed. In this case, although the reversed words are definite in character, they constitute a widely different language related in a simple mechanical way to the first taken down. When a sentence is uttered backward the instrument translates it.

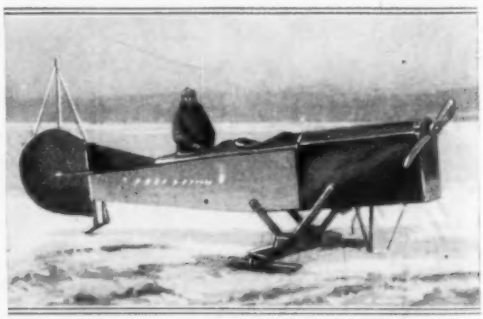
TURN OF LOCK OPENS TRUNK BY PRYING SIDES APART

Just the turn of a lock opens a new wardrobe trunk by prying the sides apart. In this way, it simplifies the task of packing or unpacking, as one movement of the hand secures or unlocks the trunk at four different points. Drawers, suit hangers, shoe compartment and laundry bag are also provided.



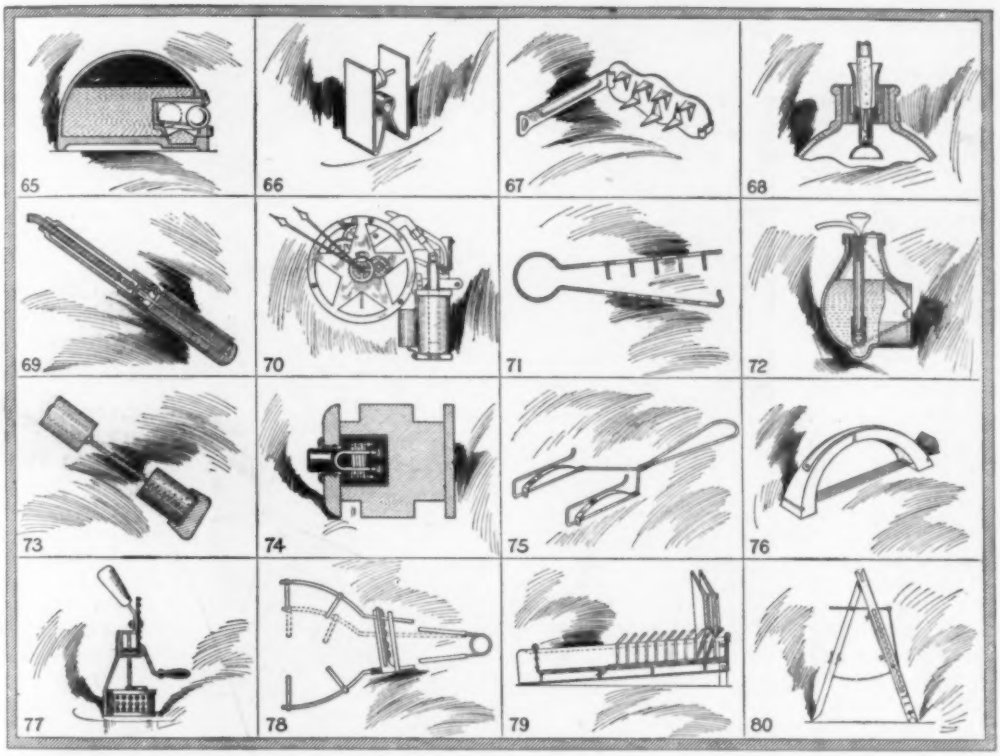
ICE BOAT FROM ODDS AND ENDS RESEMBLES AIRPLANE

With only odds and ends, an inventive northerner has built a speedy ice boat that resembles an airplane. Although wingless, it skims over frozen surfaces with all the grace of a flying craft. The maker first obtained a discarded plane fuselage. A junked automobile supplied the engine, while a few pieces of lumber and steel were used to form the runners. A special apparatus on the tail rudder guides it, while another device beneath the motor prevents it from tipping. Its cockpit seats two persons, the pilot and a passenger. A propeller replaces the usual sails.



Speedy Ice Boat, without Sails, Built from Odds and Ends, Resembles Airplane

These Articles Are for Everyday Use But— Can You Name Them?



JUST to help you, the use for which the articles are intended is as follows: No. 65, in office or home. No. 66, on wearing apparel. No. 67, for women. No. 68, in office or home. No. 69, in the home. No. 70, anywhere. No. 71, on the farm. No. 72, in public places. No. 73, in the home. No. 74, in buildings. No. 75, in the home. No. 76, in the home. No. 77, in the home. No. 78, in the home. No. 79, in home or business. No. 80, in a profession.

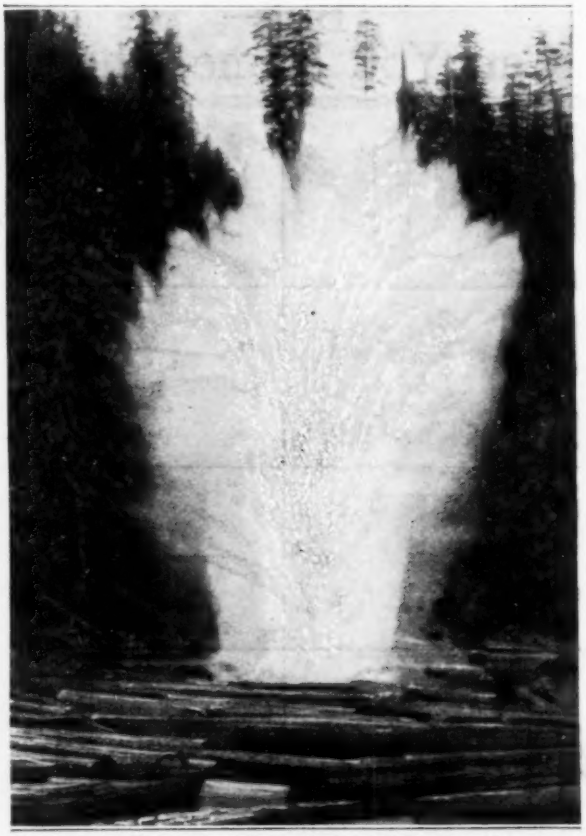
Popular Mechanics Magazine offers no prizes for correct answers to these problems, but presents them for the interest it believes its readers will find in attempting to determine the nature of the various articles shown.

If you think you have the right answers you can find out by comparing them with the correct list which will appear in Popular Mechanics Magazine for February.

In December the following articles were shown. No. 49, toothpick to be fitted on finger. No. 50, shoe-tree. No. 51, can opener. No. 52, cigar cutter. No. 53, case for eyeglasses. No. 54, chicken roost. No. 55, branding iron and holder. No. 56, envelope flap moistener. No. 57, combination helmet and muffler. No. 58, cork puller. No. 59, ice skates "head on." No. 60, shoe scraper for doorstep. No. 61, broiler. No. 62, sanitary drinking fountain. No. 63, cigar clipper made safe for fingers. No. 64, guard for wrist-watch crystal.

LOG'S PLUNGE RIVALS GEYSERS CAST UP BY NATURE

Striking a lake after traveling several hundred feet down a chute at a speed of 100 miles an hour, logs that are cut high up in the mountains of British Columbia, send up geysers that rival the tallest of nature's own spouts. Rolled upon a trough made of rough timber, which extends down steep slopes, the tree trunks gather terrific speed from their great weight. Few of them are less than four feet in diameter, and when they plunge into the pond easily displace many times their volume of water. Occasionally



Giant Geyser Created in Lake by Impact of Big Log Shot Down Side of Mountain where Trees Are Felled

big logs "jump the track," and the momentum sends them crashing and bounding with tremendous force against the stout sides of the runway. Their speed spent, they settle alongside the incline and serve to break the fall of others which leave the course, but they are not allowed to lie for long, as they would soon pile up. Some difficulty is experienced in setting these runaways back on the grooved track, where they resume the interrupted journey downward to the log pond to await their turn at the mill.

BONES OF MEN FOUND BURIED EIGHTY THOUSAND YEARS

Fossilized bones of a race of men who are believed to have lived about 80,000 years ago, and who resembled the Neanderthal type, recently were dug up in France. The relics were found in a clay bank where they evidently had been washed from a prehistoric village which was situated on the bluff above. As a result of the discovery, scientists say that more facts will be learned concerning these strange, animal-like humans, who have vanished from the earth, leaving no traces. The Neanderthal man, as pictured by authorities, was short and powerfully built, with a large head and face, deep-set eyes, low, slanting forehead, and no chin. He walked in a crouching position with knees half bent like some beasts of the prehistoric forests. His chest was triangular in shape and his hands were huge, with short, stumpy fingers. He could not talk, but expressed himself in grunts. For weapons he carried a crude stone dagger and a club. Although stupid, he buried his dead with ceremony and practiced a form of religion.

PHOTOGRAPHS OF WIND'S PATH AID AIRMEN'S FLIGHTS

To aid pilots of aerial gliders, accurate maps of air currents over rolling country are made by photographing the trail of the wind. As a result, it has been determined that the course of moving atmosphere follows the outlines of large obstacles fairly closely. Prior to the start of a contest, an airplane throwing off streams of smoke travels over the hills, moving at right angles to the breeze. These clouds, readily caught by the camera, serve as a basis for measurements which the glider pilots may use in gaining altitude.

MERCURY BURNED UNDER SEA FOR FLASHLIGHT PHOTOS

Flashlight photographs under water are now being made with the invention of a Japanese scientist. Mercury is drawn through a fine bore in a glass tube to serve as a lamp filament. When a low-voltage current is turned into it, the heat explodes the fluid almost instantly, shattering the tube and producing a brilliant burst of light of short duration. It is used to take instantaneous pictures for the study of metal vibrations and for other purposes requiring an intense ray for a brief period. The rolling of model-ship hulls is also said to be clearly shown by photographs taken with the submerged light bulbs.

WORLD'S FAIR LIBERTY BELL'S FATE SHROUDED IN MYSTERY

Efforts to find the huge bell made for the World's Fair in 1893, as a companion piece for "Old Liberty," have failed. It was sought so that it might be rung on the 30th anniversary of the exhibit, its tones to be broadcast by radio to all parts of the country. More than 250,000 persons donated money and historical relics to be melted into the piece, when it was cast.

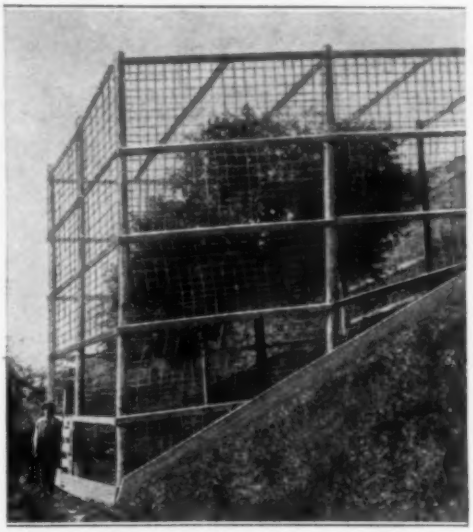
What Was Once Known as the World's Largest Bell, the Fate of which Is Veiled in Mystery

At that time, it was declared to be the largest bell in the world. What disposition was made of it after the Fair is shrouded in mystery.

¶We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

BURGLAR-ALARM CAGE GUARDS RARE APPLE TREE

Protected by a burglar-alarm cage, a rare apple tree, valued at $5,000, stands on a mountainside in West Virginia. Surrounding all its branches, a steel-wire inclosure prevents intruders from plucking the blossoms or carrying away the fruit. Other precautions are taken to guard it against harmful insects and foraging animals. At intervals it is inspected by experts and once a year sprayed with insecticide. It is vigorous and healthy, and annually bears crops, one of which totaled 35 bushels.



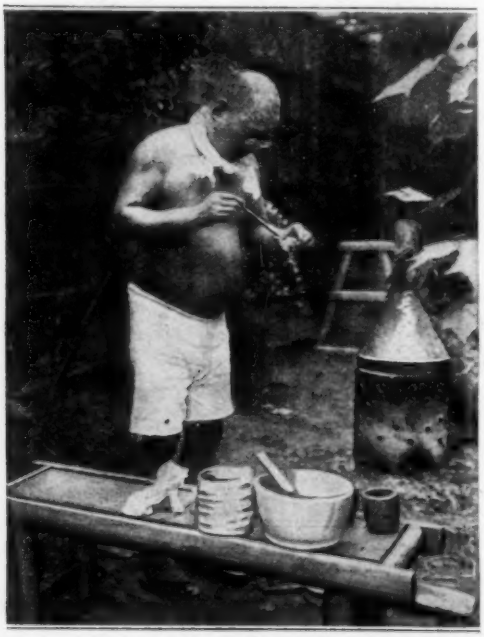
Wire Cage Fitted with Burglar Alarm that Protects Valuable Apple Tree from Men and Animals

BABY SULKY HAS LOCK SEAT TO HOLD OCCUPANT IN

To prevent a baby from falling out of the seat while being wheeled about, a sulky is being made with a front piece that fits across the occupant's legs, securely locking him in place. Slightly flexible, curved steel supports attached to the basket partly absorb shocks, thus making riding easier. Disk wheels and other metal parts are enameled black, while the body is painted gray.

BACKYARDS OF JAPAN STUDIOS OF ART AND INDUSTRY

Backyard factories in Japan, which form one of the country's greatest institutions, hum with constant activity all the year



Workman in One of Japan's Many Backyard Factories Putting Finishing Touches to a Carved Figure

round. Almost every property owner who is fortunate enough to have a plot of ground at the rear of his dwelling, has turned it into a studio or a shop in which he toils patiently day after day. As a rule the factory force consists only of the proprietor and perhaps one or two assistants. Yet the products of their labors are many and varied and of excellent workmanship. Some of these craftsmen turn out miniature statues carved from ivory or bone that are realistic and lifelike, toys, novelties, bric-a-brac, and oriental games.

RADIO BRINGS COLLEGE STUDY TO STUDENTS AT HOME

Actual college study by radio has been started in Oregon by the state university. Certificates are issued to those who listen to a series of twelve lectures. Questions regarding the course are answered by mail. While lectures by professors are a popular feature of the programs of most of the large broadcasting stations, this is said to be the earliest effort to give a real course by wireless.

NINE-STORY BUILDING MOVED BY TWELVE HORSES

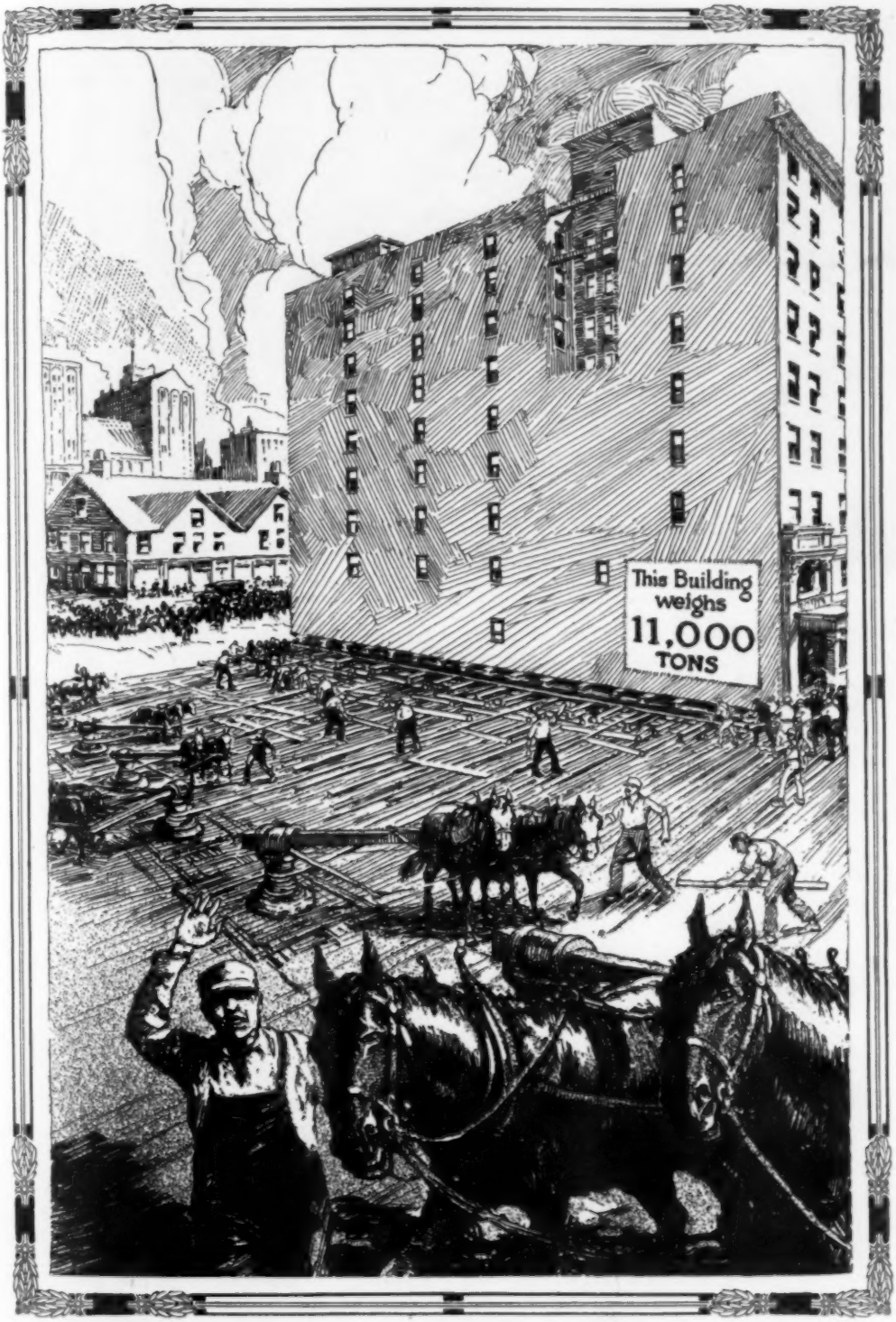
Weighing 11,000 tons, an apartment house, nine stories high, was recently moved by 12 horses. The building was carried by a framework of girders that rested on rollers placed across iron beams, which formed a track. Six vertical winches, installed at a distance, were each turned by a pair of horses, and all worked together. The runway was built so level and the motion of the load so even, that no part of the walls was disturbed.

HEAT OF AUTO ENGINE GOVERNS GAS SUPPLY AND SAVES OIL

By automatically cutting down the supply of gasoline as the motor warms up and increasing the flow as it cools, a thermostatic control invented recently is said to make starting easier. Reduction in carbon formation and oil consumption, less battery strain and spark-plug trouble, are also said to be results of the use of this device. Full power when the engine is cold, lower speeds on high gear, and 40-per-cent saving in fuel are claimed for it. A coil of metal, which expands and contracts with heat and cold, is so placed on the manifold that, as it is affected by temperature, it turns the lever of the needle valve, regulating the flow of gasoline.

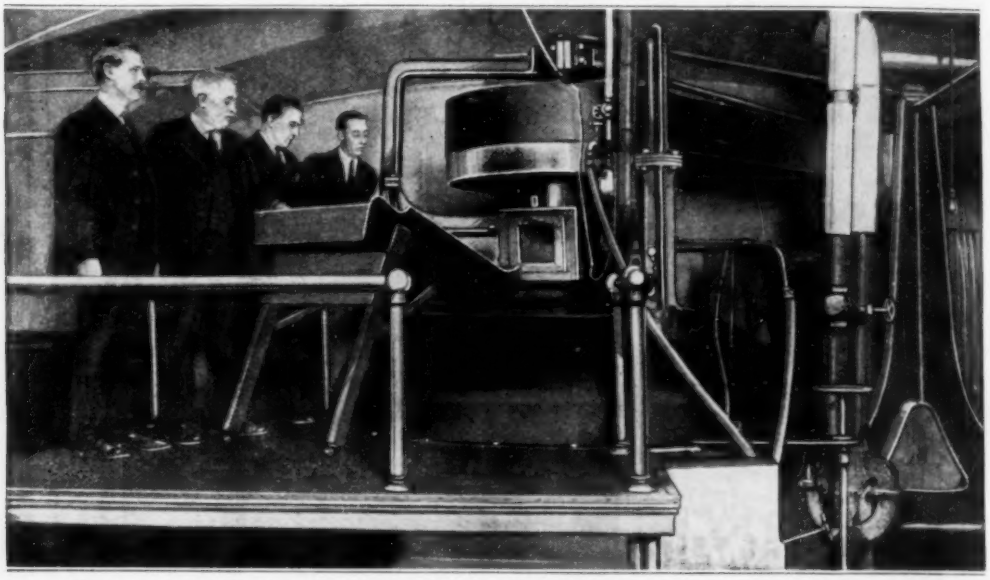
BRUSH "SCREWS" IN PAINT CAN TO CLOSE TOP

To prevent waste, paint cans are being made with tube-shaped tops into which round brushes "screw" when the articles are not in use. Others are made with rectangular openings, where brushes may be placed to close them. The painter may rest a wet brush in these troughs, where it can drip without spotting surrounding surfaces. Extending above the upper edges of the receptacle, the brush cannot overturn. When stowed away, evaporation is reduced, as the bristles, immersed in the fluid, are pulled downward by the paint's weight until the handle fits snugly.



Moving Nine-Story Apartment Building with Power Furnished by Dozen Horses: The Even Motion of the Winches and Smoothness of the Track Kept the Walls Undisturbed During the Journey

MILLIONS IN BAD MONEY DEVOURED BY MACHINE

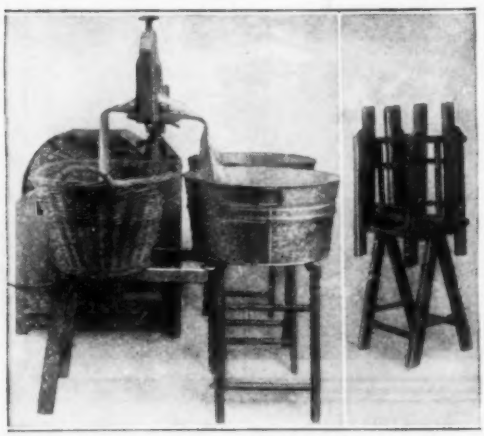


Giant Machine in United States Treasury Department, One of Ten, that "Eats" Millions of Dollars in Paper Money Which Are no Longer Fit for Circulation

Millions of dollars in redeemed paper currency, no longer fit for use, are chewed to pieces every day by 10 huge steel machines in the treasury department at Washington. About noon, these giant contrivances open wide their maws and vast fortunes in bills to be destroyed are poured into them. This task is performed by four men, composing the destruction committee, who represent the treasurer, the secretary, and the controller of currency, each of whom holds one of the three keys necessary to open the lids of the macerators.

FOLDING RACK FOR WASHTUBS KEEPS THEM NEAR WRINGER

Holding two washtubs and a clothes basket, a folding bench has been designed, which keeps them close to the wringer. As the receptacles are supported at the proper height, the wet garments do not have to be lifted more than a few inches. The floor can also be kept dry, because the pieces, in passing through the rollers, do not drop far enough to splash the rinsing water. The stand is braced so that it will not collapse or shake while in use. When closed up, the stand can be placed out of the way in a small space.



Left: Folding Washtub and Clothes-Basket Rack in Use; Right: Bench Ready for Storing

GEYSER OF BOILING MUD SEEN IN ALASKAN VOLCANO

Tons of boiling mud, hurled 200 feet into the air by a geyser rising from the bottom of the smoking, rumbling crater of an Alaskan volcano, were seen recently by a scientist, who, with a Swiss guide, descended the steep walls of the pit. Venturing within 100 feet of the curious fountain, when the vapor mists parted, the party obtained a clear view of a mud pool about 100 feet in width.

QUICKSILVER, ONCE ELUSIVE, IS "ROASTED" FROM SOIL

Difficulties of extracting mercury from ores have been overcome in Australia, where are said to be the most important quicksilver deposits in the British Empire. For a considerable time, the discoverers of this field worked at the problems with discouraging results. When cinnabar, sulphide of mercury, was treated in the furnace, the bulk of the elusive metal passed up the flue and vanished in thin air. Recently devised appliances changed that and now the plant is capable of treating 20 tons of ore a day. Broken into small pieces, it is fed into a heater, where it is thoroughly "roasted" and the metal driven off in the form of vapor. Passing through a series of condensers, immersed in cold, running water, it finally emerges in a refined, liquid state.

TOY CALCULATOR HELPS STUDY FOR PUPILS IN FIGURES

To arouse children's interest in arithmetic problems, and to make such studies easier, a small pocket-size calculator has been designed for teaching them to add, subtract, multiply, and divide. Aided by this device, which is easy to operate and accurate, it is said pupils in the primary grades quickly learn the various tables. Simple examples in mathematical subjects are speedily worked out and illustrated by the machine. It is fashioned from metal and made so that it cannot be easily damaged.

GASOLINE ENGINE IS STARTED BY EXPLODING CARTRIDGE

Gasoline engines that operate the trucks of big disappearing guns of the nation's coast defenses are started by the explosion of a shotgun shell in one of the cylinders. A blow of the hand on a small knob fires the charge, which has sufficient force to "turn over" the shaft several times. Before the operator has reached the control switchboard, the engine usually has attained such speed that the dynamo it operates is able to supply sufficient current to move the cannon.

QUEER DRAWINGS GUARD BABES FROM EVIL SPIRITS

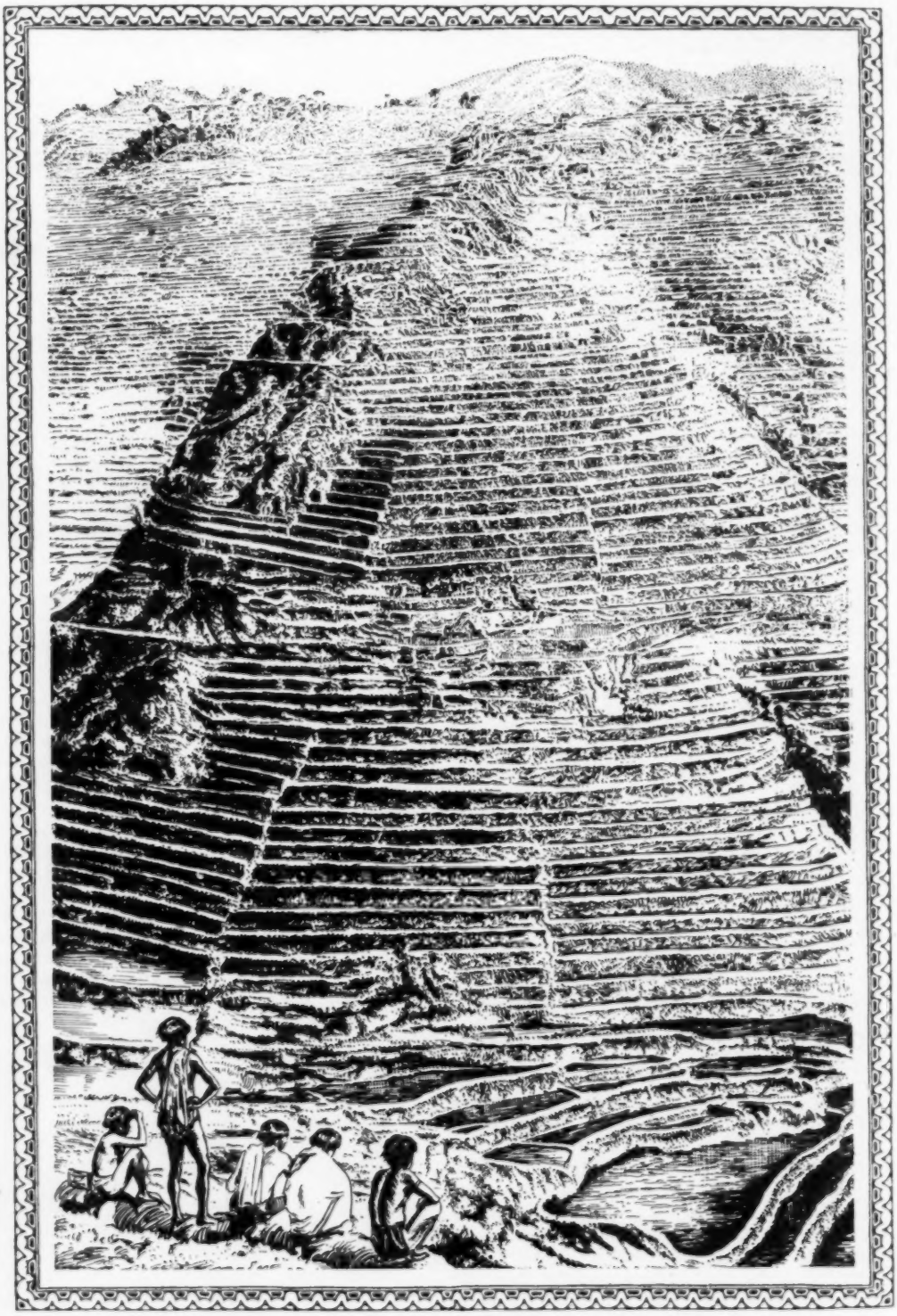
True to beliefs in the power of mysterious ceremonies to overcome the wiles of evil spirits they believe to be seeking to harm little children, some mothers of India resort to strange devices to ward off the unseen demons. In one section of the country, the parent protects her babies' health by drawing strange designs on the ground around the dwelling. This is supposed to drive off any harmful influences that might attempt to cast a spell over the youngsters.

Copyright, Keystone View Co., Inc.
Mother in India Painting Queer Designs on Ground to Keep Evil Spirits from Harming Her Babies

CAN OPENER PUTS DULL EDGE ON TIN TO PROTECT HANDS

Bending down the edge as it cuts, to prevent possibility of scratching the hands, a recently invented can opener makes a rounded, smooth-rimmed top. With slight pressure of the thumb, a sharp-pointed cutter pierces the tin, and then the cover may be removed with a forward and backward movement of the handle, which at the same time turns the jagged edge under.

Can Opener that Protects Hands from Cuts by Putting Rounded Edge on Tin



Steep Slopes of Formerly Barren Mountains Covered with Stone-Walled Terraces which Are Irrigated by Water Brought from Great Distances through Sluices Built by Head-Hunting Tribesmen

WILD TRIBES IRRIGATE STEEP SLOPES OF BARREN HILLS

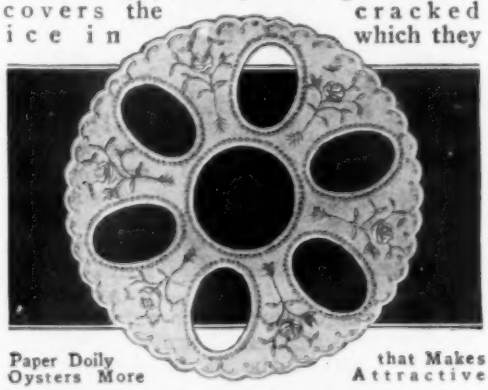
Rivaling irrigation works of the more modern world, wild head-hunting tribes of the Philippine Islands have converted steep, barren hillsides into fertile areas for cultivating rice. Brought in crude troughs built around rugged mountains, the water flows through a maze of terraces, confined between stone walls eight feet high. It is estimated that the total length of these barriers is more than 12,000 miles, or one-half the distance around the earth. Although the natives are little inclined to agriculture, the greater part of their farming efforts is employed in the cultivation of grains for food.

VOLCANO UNDER SEA CASTS STEAM ABOVE WATER

Over a volcano, erupting far beneath the surface of the water, mariners in the South Seas recently noted a column of steam 100 feet in width and almost as high. Trailing out over the ocean for more than a mile, the vapor became dissipated, though there remained a marked disturbance and discoloration of the water in a large area. At first the sailors mistook the white clouds for the smoke of a passing vessel.

PAPER FOR SERVING OYSTERS HIDES SHELLS AND ICE

For serving raw oysters in an attractive manner, a paper doily is being made that covers the cracked ice in which they



Paper Doily that Makes Oysters More Attractive

are imbedded thus giving them a more appetizing appearance. Circular in shape, the covering is provided with openings to admit six shells, while a larger perforation in the center fits a cup for cocktail sauce. Inexpensive, this garnishment adds distinction to the service.

MOVIES SHOWN IN DAYLIGHT OR ON ILLUMINED STAGE

Motion pictures can now be shown in daylight or on a lighted stage with a new type of screen that also prevents distor-

Showing Motion Pictures in Daylight on Screen that Also Prevents Distortions

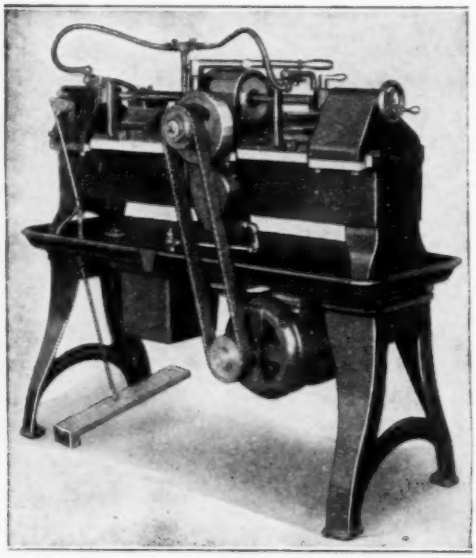
tion. Pictures appear true to form, viewed from either the front or back of the curtain, or from any angle. Instead of being located in front of the screen, as in darkened theaters, the projector is placed behind it. This arrangement, it is pointed out, is safer in case of fire, as the audience would be shut off from the flames. For homes, schools, and like places, portable outfits are being made that can be packed into a small case and carried about. One of the hardest problems in developing the material was caused by damp weather, during which the screen stretched like a piece of elastic. No loom could be found to weave the fabric without destroying its luminous qualities. One was finally devised that would turn out a piece of silk 20 feet wide without a single seam. The screen is noninflammable, waterproof, and has a fine corrugated surface which gives the picture depth and prevents glares.

DUSTLESS CHALK TO PROTECT HEALTH IN SCHOOLROOMS

To promote health and cleanliness in schoolrooms, dustless blackboard chalk is being made in the South. Ribbed, so it can be easily held, the crayon is said to leave no powder on the hands, clothing, or writing surface, thus helping to keep the air pure and rooms clean.

LATHE TURNS BOTH ENDS OF SHAFT AT ONCE

For turning automobile axle shafts, cam and drive shafts, and similar parts, both



Both Ends of Automobile Axle Shafts and Similar Parts Are Turned at Once on This Lathe

ends of which can be turned at the same time, a special lathe has been developed.

The headstock is in the center of the bed, and has a hardened and ground spindle, with a 2⅛-in. hole through it. It is driven, through a worm drive, by a constantly running clutch, which is arranged to stop the lathe the instant it is thrown out.

The carriages are cam operated, and both straight and taper work can be turned with them. An important feature is that the carriages are automatically returned to the starting point after reaching the end of the cut, thus relieving the operator of all operations other than loading, unloading, starting, and stopping the machine. All screws are provided with chip shields, and the sprocket and chain drive to the headstock are adequately covered.

LEADIZING PROCESS PROTECTS PIPING AND PLATES

No practical protective coating has, until recently, been available for piping and steel plates subject to corrosion. The galvanizing process is not reliable, as it affords no protection from acid fumes, and the coating is easily damaged, and flakes off when the pipe or plate is struck or bent. A new process, by which the metal is coated with lead, offers complete protection against acid, even at threaded joints, where the greatest trouble was encountered previously.

After the material has been thoroughly freed from grease, oil, rust, and scale, it is immersed in a bath of hot acetate of lead, which leaves a thin, homogeneous coating of lead on the surface. The material is then placed in a bath of acetate of lead and iron sulphate, and plated, using lead anodes. The final step is to paint the pipes or plates, and the paint adheres firmly to the treated surface, as it has a natural affinity for the lead coating.

The coating is even, malleable, and is not subject to damage from bending or distortion. In the case of steel tanks used for boiler-washing systems, the plates are coated after cutting and punching, then bent to shape before erection, and assembled with lead-treated rivets, driven cold, the formed heads being placed inside the tanks, and exposed to the water.

RUGGED SHAFT HANGER MADE OF PRESSED STEEL

Made entirely of pressed steel, a shaft hanger now on the market possesses elements of distinct novelty. The hanger is of the four-point setscrew type, and "parts" so that the shaft or bearing may be readily removed. All bolts, nuts, and setscrews are of standard sizes, and are accessible and convenient for replacement.

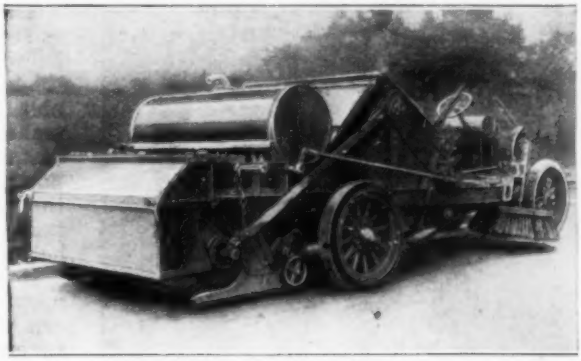
The bearing nuts on the setscrews that support the shaft load are flush with the inside edge of the shaft opening, thus permitting a minimum amount of overhang for the setscrews themselves. The appearance of the hanger is unusually neat, and the frame is smooth, with rounded surfaces that eliminate dust pockets. The hanger is made in regular drops—7 to 24 inches—and for all shaft sizes up to 3 inches.

"PICK-UP" STREET SWEEPER IS MOTOR DRIVEN

Although horse-drawn vehicles have largely passed into history as the chief problem of street sanitation in American cities, the civic pride of progressive communities continues to support the cost of clean streets. Dirt cannot be avoided, under present conditions, but when it is allowed to accumulate, or is only partly removed by the manual labor of "white wings," it presents an unfavorable indication of the character of city housekeeping.

Even small municipalities can afford to modernize their street-sweeping methods now that a "pick-up" motor sweeper has been developed that not only has a special gutter-broom attachment, thus dispensing with manual labor entirely, but that has a comparatively low initial cost, and is economical to maintain.

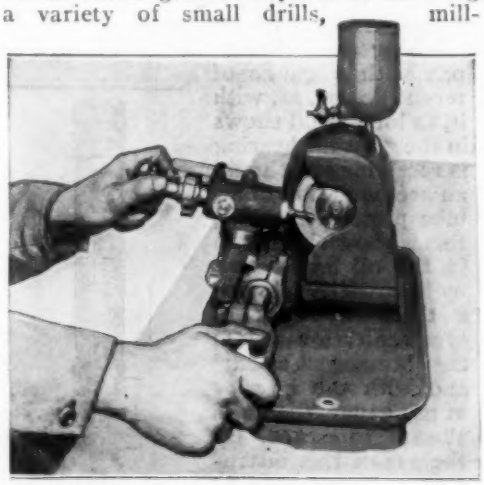
The automatic gutter broom works in and out with the curb line, without attention from the driver, and the rear broom is so designed that wear automatically shortens the distance between broom and conveyor. A 150-gal. water tank is provided for the sprinkling system. Only one man is required for the operation of the machine, and all levers are so arranged that the operator has complete and convenient control without leaving his seat. The working speed of the sweeper is 9 miles per hour on average pavement.



One-Man Motor Street Sweeper with Gutter Broom, that Eliminates Manual Labor Completely

VARIETY OF TOOLS HANDLED BY CUTTER GRINDER

The increasing demand for a small universal cutter grinder capable of handling a variety of small drills, milling cutters, and engravers' tools has resulted in the development of a tool especially adapted for this work.



Drills, Milling Cutters, and Engravers' Tools Can Be Accurately Ground on This Bench Machine

With this grinder, all tools of a particular variety can be ground to a predetermined angle, even by an inexperienced man. The work produced with tools uniformly ground is much superior to that done by a "hit or miss" method, and the life of tools is correspondingly prolonged; in addition, the time lost in regrinding tools is considerably reduced, and the labor of a skilled mechanic is not required.

The new machine is a compact bench tool, simple and rigid in construction. It has a universal head that makes it adaptable for the grinding of many types of cutters, with all kinds of angles and reliefs, while a smooth-running, specially designed motor furnishes a high speed for the wheels. An auxiliary wheel is furnished, which permits free hand grinding when desired, thus giving greater flexibility to the machine. Both wheels are completely guarded, and the guards are designed so that the wheels may easily be removed from the spindle. The capacity of the cutter spindle is from ⅛ to ½ inch, and an index plate is furnished to provide for the grinding of various cutters having flutes up to 1¼ inches in length.

CULTIVATING AND SPRAYING CROPS AT SAME TIME

Designed to be attached quickly to either riding or walking cultivators, a new

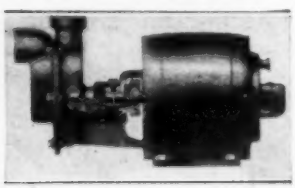
Light and Compact Spraying Outfit Mounted on Cultivator

spraying unit has been very successful in combating the boll weevil in the South.

The spraying is done at the best time—while the crop is being cultivated—without any additional labor expense. The machine is completely automatic, a regular valve controlling the pressure on the spray nozzles, and keeping it uniform regardless of variations in the speed of the pump, which is driven by sprockets and chain.

RING-OILED GLAND FEATURE OF COOLING-FLUID PUMP

Difficulties encountered in the use of pumps for cutting lubricants, due to the abrasives present, are eliminated by a new design of motor-driven centrifugal pump. There is only one working part, the impeller, and the shaft is fitted with a ring-oiled packing gland, which keeps the bearings from coming in contact with the liquid being pumped and provides a positive supply of oil. A priming chamber enables it to work within its suction capacity above the level of supply, without the use of check or foot valves, which are not reliable for this service. The unit has sufficient capacity to supply a group of machines from a central point, and is very compact. It may be used for either floor or wall mounting, and may be located in isolated places, where little or no attention will be given it over long periods.



FLUID HARDENS CAST IRON

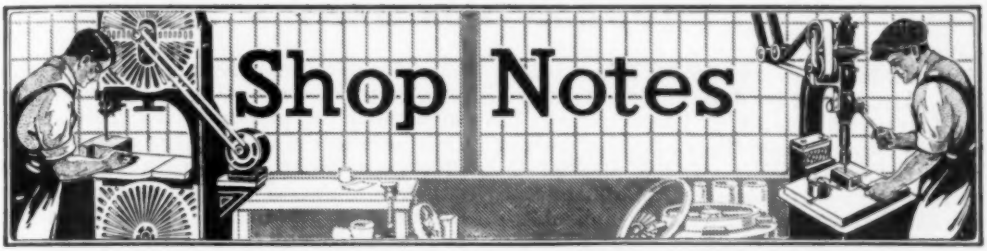
That it will harden cast iron as easily as steel is the claim made for a fluid now being marketed by a western concern.

The fluid is mixed, for use, with a suitable quenching oil. If the iron is to be made medium-hard, the mixture is made in the ratio of 1 part of the fluid to 100 parts of oil, and for extreme hardness the ratio is 50 to 75 parts oil to 1 part fluid. The metal is heated to a red heat, below scaling point, and quenched.

It is stated that the temperature of the metal and the strength of the solution govern the hardness of the metal, so that various degrees of hardness can be obtained. The metal may be annealed and returned to its original degree of hardness by reheating and allowing it to cool slowly in air. It is said that castings treated with the fluid will measure 450 on the Brinell scale, and resemble high-carbon steel in general properties.

TURBINE OIL-PRESSURE GAUGE DETECTS AIR

Ordinary pressure gauges, being generally placed at the highest point of the turbine oil-discharge line, may register a pressure of air when no oil is actually reaching the bearing. This cannot happen with a gauge of recent design, as, with it, as long as oil shows in the glass the bearing is receiving oil; should an accumulation of air take place in the line, this is shown by a drop in the oil level, then, by alternately placing a three-way cock in communication with the bearing "saveall" and with the interior of the gauge, the air is allowed to escape. By the use of this instrument the usual test cock on the oil line is eliminated. Having no moving parts, it is unaffected by vibration, and may be mounted directly on the bearing covers.



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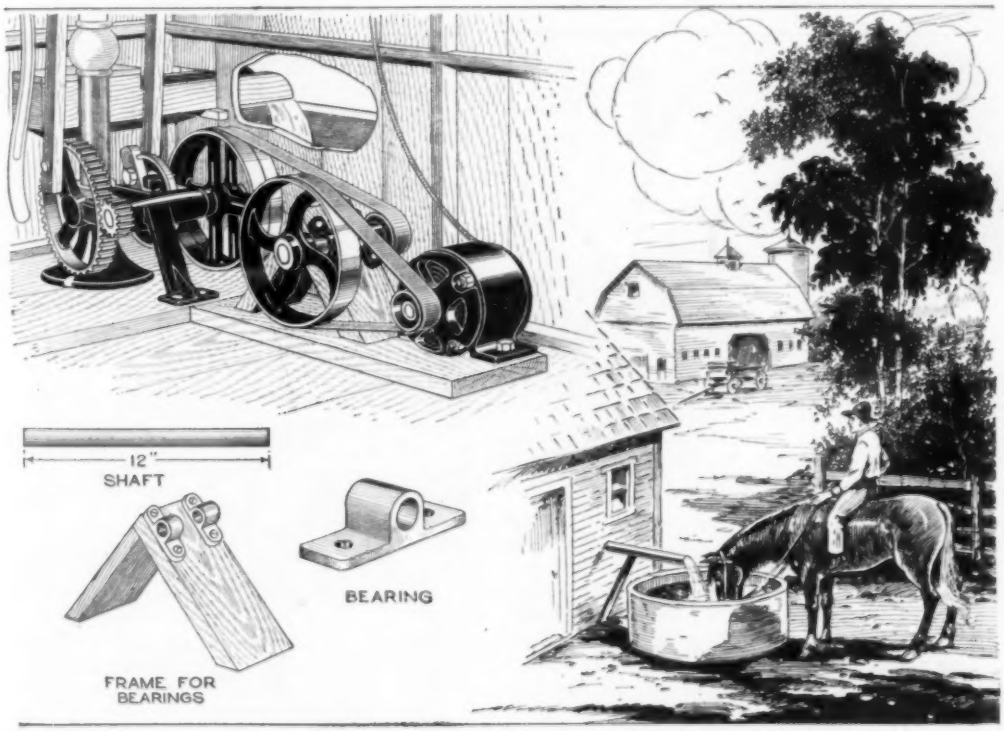
Driving the Farm Pump Electrically

By J. R. KOONTZ

IN these days of private electric-light plants on the farm, and with the extension of city light and power lines far out into the country, the thoughts of the farm dweller naturally turn to the utilization of the current in as many practical ways as possible.

One of the best uses to which it can be adapted is that of pumping the daily supply of water. The price of a good motor is considerably less than that of a gas engine, and the motor is much easier to handle. It is generally thought that a motor of at least 1 hp. is necessary to drive the pump, and this deters many farmers from trying to do the job by electricity. The fact that a ¼-hp. motor is plugging merrily away every day on my farm, pumping water from a 180-ft. well for nearly 150 head of horses, cattle, and hogs proves that a large, expensive motor is not by any means necessary.

An ordinary pump jack such as used with a gas engine, is used; if there is one already on the pump, so much the better. To reduce the speed of the motor to the correct speed for the pump, it is necessary to provide a secondary jack, or countershaft, and this can readily be made from material found around the farm, or at any



Adapting the Farm Pump to Electric-Motor Drive Is a Simple Job, but One that Will More than Pay, in Comfort and Convenience, for the Time Spent on It

junk dealer's. Two pulleys will be needed, one 12 in., the other 4 in. in diameter, by 3 in. face; also a piece of 1-in. shafting, 12 in. long, and two bearings or pillow blocks to fit the shaft.

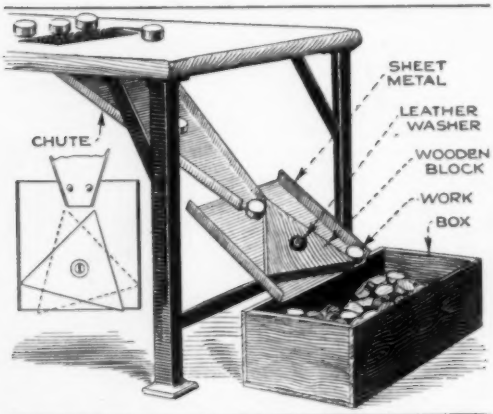
Two pieces of 2 by 8-in. plank, one 10 in. long, the other 12 in., are spiked together to form an inverted vee, as shown in the details, and the V-frame bolted to another piece of 2 by 8-in. plank, long enough to carry the motor also. Bolt the bearings in place as shown, taking care to shim them so that the shaft will run freely, then attach the pulleys.

Bolt the motor to the end of the plank, with its 1½-in. pulley alined with the 12-in. pulley on the V-frame, then fasten the plank so that the 4-in pulley will aline with the 12-in. pulley on the regular jack. It is best to cut slots in the plank for the motor and V-frame bolts, so that the belts can be tightened easily. Cut and splice the belts in place, and connect the motor to the switch, and the job is complete. The pulley sizes given here are correct for a motor speed of 1,750 r.p.m., with a 1½-in. pulley on the motor, and a 12-in. pulley on the pump jack.

The running expenses for this outfit have been only 27 cents per month during the hottest months of the year, when the most water is consumed.

A Work-Chute Distributor

The drawing illustrates a very simple distributing device, used in connection with a chute that delivers the work from

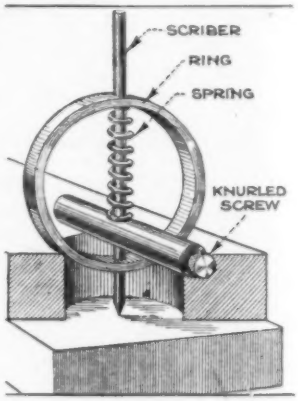


Distributing Work from Machine So that Box Is Evenly Filled

an automatic cutting machine into a box beneath. Before this attachment was used, considerable trouble was experienced, as the pieces always dropped in the same place and formed a pile, which "overflowed" before the box was actually full. The attachment consists of a square piece of sheet iron, with the outside edges turned up, riveted to the chute. Loosely attached to this by means of a nut and screw and two leather washers is a triangular piece of wood. The device works as follows: As one piece drops down the chute it slides down one side of the triangular block, and, in passing between this and the turned-up edge of the metal to which it is attached, forces the block over so that the next piece drops down the opposite side. The process is thus repeated until the box is filled, which is done evenly without any attention from the operator.—Harry Moore, Montreal, Can.

Transferring Hole Centers

The usual practice, when transferring the centers of large holes, is to scribe around the diameter and afterwards mark off the center of the scribed circle. The work is simplified considerably with the use of the tool shown in the drawing, which is made especially for this kind of work. A piece of good, straight tubing is drilled through for a scriber or pointer, and a short piece of round bar is also drilled the same size. This part is also drilled and tapped at one end, to take a knurled tightening screw, which extends up to the hole drilled through it.

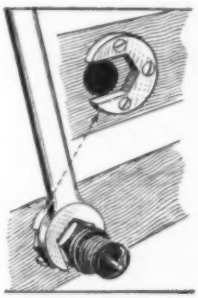


When finished, the parts are assembled as shown, with a light coil spring over the scriber. To transfer the center of a hole already drilled to another piece to be drilled the same size, the body of the tool is placed on top of the hole, and the scriber pushed down to touch the face of the second piece. Then with the knurled screw tightened, the tube is pressed down snugly and rocked back and forth once or twice, the same procedure being carried out after the tool has

been turned to a position at about right angles to the first. The result is a cross marked in the exact center of the hole. No accuracy is required when setting the scriber to depth; it must, of course, touch the face of the second piece, but if set a little heavy it will lift on the high spot as the tool is rocked.

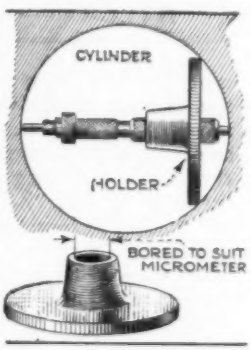
Unscrewing Separable Plugs

The usual method of unscrewing separable plugs for cleaning, putting in new gaskets, or replacing porcelains, is to hold the body of the plug in one hand by means of a wrench, while the packing nut is unscrewed with another wrench, or a pair of pliers. A much handier method is shown in the drawing. A hole is bored in the edge of the bench, large enough to receive the porcelain head, and over this hole is screwed a metal plate, shaped like the head of a wrench, and with an opening that fits the packing nut. It is but the work of a moment to slip the plug between the jaws, and to loosen the body with a wrench.



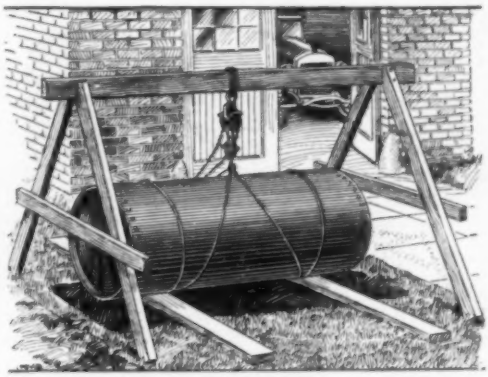
Holder for Inside Micrometer

When using an inside micrometer, it must be moved vertically and horizontally, and considerable adjustment is necessary to obtain an accurate measurement. The work can be greatly facilitated by using the attachment shown in the illustration, which makes it possible to set the tool across the center of the bore at once. The attachment is a circular disk of brass, or steel, with a boss which is drilled to a good sliding fit on the thimble of the micrometer, so that it can be slipped on and off easily. The diameter of the disk is about 2½ in. when used for bores having a diameter of 5 in. or more. For smaller bores, the diameter should be about 2½ inches.



Lowering Storage Tanks

While various methods are employed for installing underground storage tanks, the method shown in the drawing has been found highly satisfactory, as it is only necessary to dig a pit that is just large enough to receive the tank, and because the tank can easily be turned around so as to bring the openings to their proper positions. Planks are placed over the pit and the tank is rolled on these until it is directly over the pit and in position to be lowered. The chain or rope slings are then put in place and the tank is raised a little with the block and tackle, which is lashed to the simple wooden frame shown in the illustration. The boards are then removed from under the tank and it is lowered into place. This method makes it unnecessary to dig an incline on one side of the pit to slide the tank down on skids.



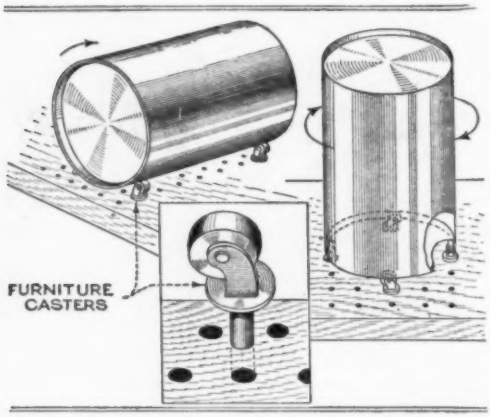
A Simple and Convenient Method of Lowering Large Metal Storage Tanks into Pits Dug for Them

Improvised Polishing Wheel

A simple and effective polishing wheel can be made by mounting a wooden disk on the shaft of a small motor, or on the screw chuck of a lathe, and covering the circumference of the disk with ordinary friction tape, which is then sprinkled with carborundum powder of suitable fineness. The disk must be turned down to a true edge and the tape must be wound in the direction that the wheel revolves, otherwise it will unwind in use. The carborundum powder should be well rubbed and patted into the tape, and, as it is quite easily torn from the tape by polishing, it must be renewed frequently. For the finest grades of powder it is well to rub the surface of the tape with tallow, before applying the powder.

Casters Facilitate Tinsmith's Work

Ordinary furniture casters, set in holes in the workbench, as shown, have been found to facilitate the handling of milk

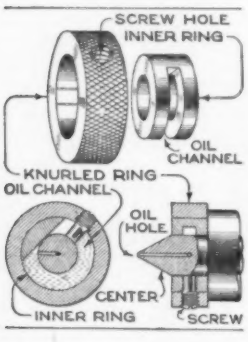


Furniture Casters, Set in Holes on the Workbench, Facilitate the Handling of Cylindrical Containers

cans and other cylindrical work, while soldering or repairing. A number of holes, large enough to receive the shanks of the casters, are drilled in the benchtop, and four casters inserted at points most convenient for the work, whether in horizontal or in vertical position. The time-saving features of this idea will be understood instantly by anyone who has done much repairing on such work.

Lubricating Lathe Centers

While running work at high speed in the lathe, the centers are apt to run dry, and if this is not detected in time, to burn out. With the device illustrated, there is always a small supply of oil at the center, and when necessary, the oil can be forced out quickly.

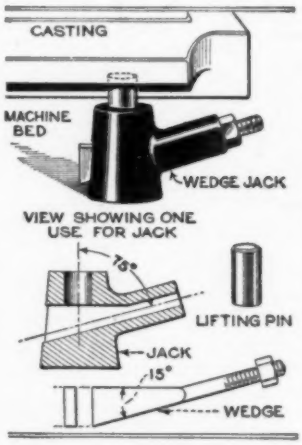


First, a small hole is drilled down along the axis of the center, and another is drilled through the side to break into this. A ring of cold-rolled steel is made, the hole being a snug fit on the straight part of the center. This piece is then slotted in the center, leaving a solid segment on one side, as shown. Another and larger ring is made, the hole of which is a nice working fit on the outside diameter of the inner ring. The outside ring is knurled, and tapped for a special screw; the latter has a plain part extending into the slot in the inner ring, in which it is a good sliding fit.

The device fits on the center in the position shown. To fill with oil, remove the screw, and pour the lubricant through the hole. The oil is held in the slot in the inner ring, which forms a reservoir. Replace the screw and tighten until it touches the center. It will be seen that the screw holds the two rings together, and that, when the outer ring is turned to the right, the oil in the slot or reservoir will be forced out by the plain part of the screw through the small holes to the center of the work.

Wedge Jack for Planer

The small wedge jack shown in the drawing is for use on the planer, under castings where there is not enough space



to use a screw jack. The jack consists of four pieces; the jack body, a lifting pin, and a wedge, with a nut on the threaded end. The jack is a steel casting of the shape shown; the holes are drilled at a 75° angle, and the upper surface of the wedge hole is slotted as shown, so that the two sides are at an angle of 15°, the surface of the wedge being machined to suit. In use, the wedge is inserted in the jack, the nut screwed on the threaded end, and the lifting pin put in place. By turning the nut, the horizontal surface of the wedge is lowered or raised, and this, of course, lowers or raises the lifting pin. The shanks of the jack and wedge can be made as long as necessary so that they will clear the work.

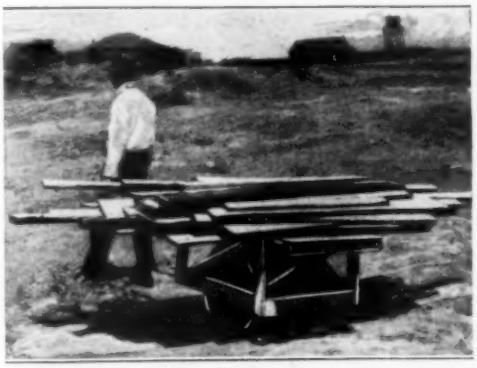
¶Do not use paint containing compounds of lead about stables or outbuildings where the fumes of decaying organic matter arise, as these gases are likely to darken the color of lead paints.

Cocoa Mats for Workers

There are numerous places where it is not desirable to use wooden gratings or slat flooring for protecting the workers' feet from hard concrete floors. Under such conditions it will be found that ordinary cocoa matting will afford a cheap and durable protection.

Wheelbarrow for Soft Soil

An ordinary wheelbarrow has little value on soft or sandy soil, as the wheel sinks into the ground, and it becomes almost impossible to push the barrow ahead. However, a wheelbarrow of the kind shown in the photo, will easily carry a heavy load over soft ground. It does not resemble an ordinary wheelbarrow, but has a drum about 1 ft. long and the same in diameter, substituted for the

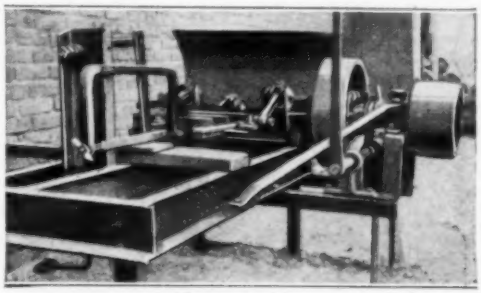


A Wheelbarrow Equipped with a Drum Instead of a Wheel Is Convenient to Handle on Soft Ground

wheel. The drum is made by cutting two circular pieces of wood about 10 in. in diameter, from 1-in. boards, to form the ends. These ends are reinforced with cleats of 1 by 4-in. material, nailed or screwed across the grain of the disks. Strips of wood, 1 ft. long and 1 in. square, are nailed to the edges all around the disks, to form the drum. A 1¼-in. hole is drilled through the ends in the exact center, and a 1¼-in. pipe pushed through, to serve as an axle or shaft. It is securely fastened to the ends of the drum by drilling a small hole through the pipe, on each side of the drum, driving a small rod through each hole, and then fastening the rod to the drum with staples. The load is carried on a frame made of any material convenient, mounted above the drum, and pivoted on the axle shaft, as shown in the photo.—W. W. Fairbanks, Fort Bragg, Calif.

Power Hacksaw Made from Auto Engine

The photo shows an efficient power hacksaw made from an old automobile engine. The cylinder block of the engine,



An Efficient Power Hacksaw, Made from an Old Automobile Engine Mounted on a Steel Frame

with the crankshaft in place, was turned upside down, and set at one end of a channel-steel frame. The block was then cut so that the connecting rods of the first and last cylinders could be swung outward on one side. To the ends of these connecting rods is attached a frame that holds the sawblade frame, which is made from a steel bar, bent to the shape shown. The regular flywheel and clutch are left in place and a pulley is fitted on the end of the crankshaft so that a belt can be used to run the saw.

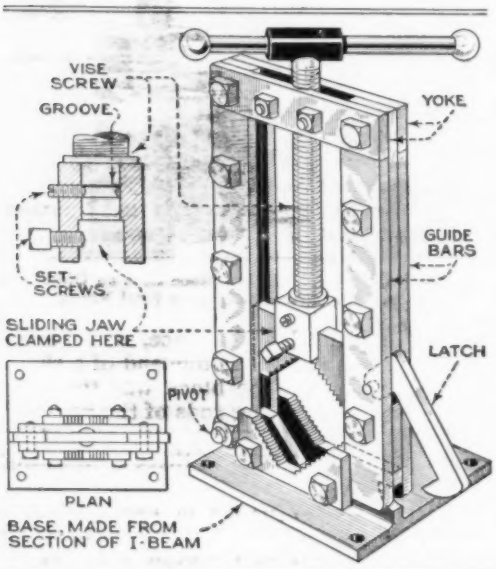
Making a Leather Pulley

A homemade leather pulley that was used on an electric motor is shown in the illustration. It was made from a number of leather disks, two steel collars, and a steel bushing. The leather disks were cut from old belting, to a diameter larger than the finished size of the pulley, and were glued together. A hole was drilled through the center so that they would fit snugly

on the bushing, which was cut from steel tubing and threaded on both ends; the collars were drilled and tapped to fit the bushing. When the collars had been drawn up so as to clamp the leather disks as tightly as possible, the pulley was put in the lathe and crowned.—R. M. Thomas, Denver, Colorado.

Built-Up Pipe Vise

The drawing shows a built-up steel pipe vise that is much stronger than the usual cast or malleable-iron pipe vise. The jaws used are taken from an ordinary vise, or they can be sawed and filed from tool steel, and then hardened and tempered. Owing to the various sizes and shapes of these jaws, and the different methods of holding them, no dimensions have been given, but with a set on hand the vise can be built up around them, changing the design to suit.



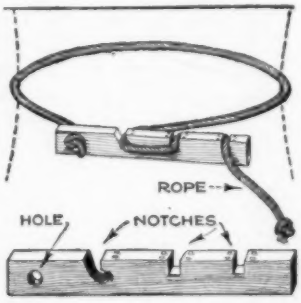
A Homemade Pipe Vise, Made from a Section of I-Beam and a Number of Short Steel Bars

All parts of the vise are made of stock sizes of structural and machine steel. The base is part of a short section of I-beam, the fixed jaws being bolted to each side of the central web as shown, using shims if necessary, to set them out far enough. The frame consists of two central bars, joined at the top by a yoke, riveted or bolted on. The central bars must be of the same thickness as the web on the base. Two sets of guide bars, which may be of thinner stock than the yoke, are bolted to the sides of the center bars to guide the movable jaw. One center bar is cut and filed to take a latch, which pivots on a pin driven through the side of the bars. The opposite set of guide bars is drilled for a pivot bolt and the end of the web is rounded off to permit the frame to swing open when inserting the pipe.

It is best to fill up the center of the yoke with a steel filler, riveted in place securely. The yoke is then drilled and tapped for the vise screw, which is made of a machine bolt ¾ in. in diameter, and threaded up to the head. A hole is drilled through the square head to accommodate a steel tightening bar or handle. A rectangular groove is drilled and filed in the end of a piece of square or round machine steel to take the sliding jaw, which is held securely by a setscrew. If the jaw has bolt holes in it, a long yoke of different pattern will have to be made. The easiest method of attaching the vise screw to the movable-jaw yoke is to turn down the end to fit into a hole drilled in the yoke. A hole is drilled through the side of the yoke and partly into the end of the vise screw, then the screw is removed and a groove turned in it where it is spotted by the drill. The hole is tapped and a setscrew fitted; this will prevent the vise screw from coming out as the jaw is raised. When turning the end of the vise screw a flange is formed, which must take the pressure when the movable jaw is turned down, and for this reason it should be as wide as possible. The stationary jaws are bolted in place and the center part of the web is cut down to conform to them in shape. A notch is also cut in the edge of the web to take the latch.

Corn-Shock Tightener

The illustration shows a quick-acting corn-shock tightener that has been found very convenient. It is made from a length of rope, long enough to go around the shocks, and a piece of wood 1 by 2 by 10 in. in dimensions. A hole is drilled near one end, and notches are cut at the points indicated, all being large enough to admit the rope. Small nails are then driven into the wood, to prevent it from splitting between the notches, and the rope is knotted at one end and passed through the hole. The method of bringing the rope around the shock and tightening it in the grooves is clearly shown in the upper illustration.—A. L. Gillis, Mount Pleasant, Ia.

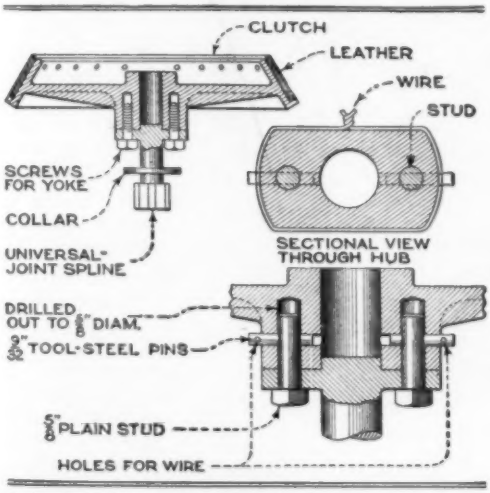


Repairing Auto Clutch Shaft

A certain type of automobile has two 5/8-in. fine-thread screws fastening the yoke end of the clutch shaft to the clutch, as shown in the illustration, at the upper left. These screws often become loose, and are then likely to strip, making it impossible to release the clutch.

This happened on my own car, and to make a quick, but permanent repair, the job was done in the following manner: The clutch and its shaft were taken out of the car, and after the two screws were removed, the screw holes were reamed out to exactly 5/8 in. in diameter. This removed all the threads and left the surfaces of the holes perfectly smooth. Long capscrews were then obtained, and the threaded ends were cut off, leaving plain studs, about 1½ in. long. With the yoke and studs in place, holes were drilled, as indicated, for 9/32-in. tool-steel pins; these were a tight fit, and kept in place with a piece of soft wire, passed through small holes in the ends and then brought around the clutch hub and twisted, as shown.

This repair was found to be just as strong as the screw arrangement, and there was much less danger of its com-



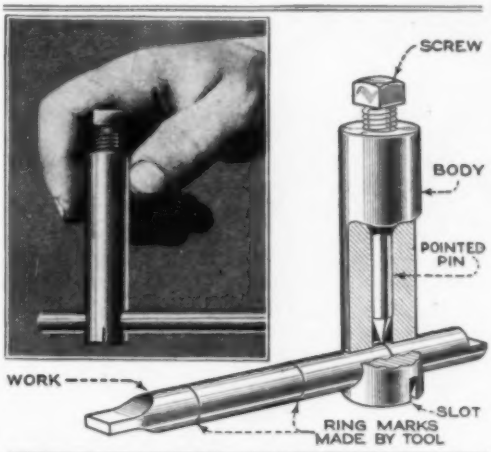
Quick Repair on an Auto Clutch: The Screws Are Removed and Plain Studs Substituted for Them

ing loose than before. Furthermore, it was easy to dismantle the clutch when necessary.—J. V. Romig, Allentown, Pa.

A test-tube brush, obtainable at any wholesale druggist's or laboratory-supply house, has been found to be very satisfactory for cleaning chips and dirt from the hollow spindle of a small lathe.

Circle-Marking Tool

The tool shown in the drawing and photograph was made for the purpose of scribing true lines around light rods, the

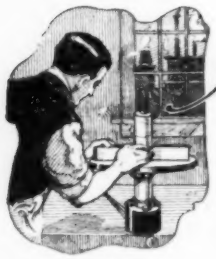


An Easily Made Tool for Scribing Circles on Light Rods Accurately and Quickly

lines being afterward used to locate the position of holes drilled partly through the rods. The body of the tool is round cold-rolled steel. A hole is drilled lengthwise in the center to take a pointed pin and the hole is tapped at the end for a screw. Another hole, the approximate size of the rods, is drilled at right angles to the first at one end, and a slot is cut in the end at right angles to the hole for the rods. In using the tool the position of the circle on the work is first determined and after marking this with a fine punch the tool is slipped on and located in line with this mark by bringing the mark in the center of the slot. The screw is then turned in until the hardened point of the pin touches the rod, when, by revolving the tool, a true line is marked around the rod.

A Simple Spirit Lamp

A new oil can with a wick of cotton string makes an excellent spirit lamp. For applying intense heat at a small joint it is only necessary to press the bottom of the can; the pressure will then force out a hot flame, making the lamp act as a blowtorch. On small work the lamp may be used sideways or at an angle, which is not possible with the ordinary kind of spirit lamp. For soldering small wires in radio work, or for light brazing, this lamp has few equals.



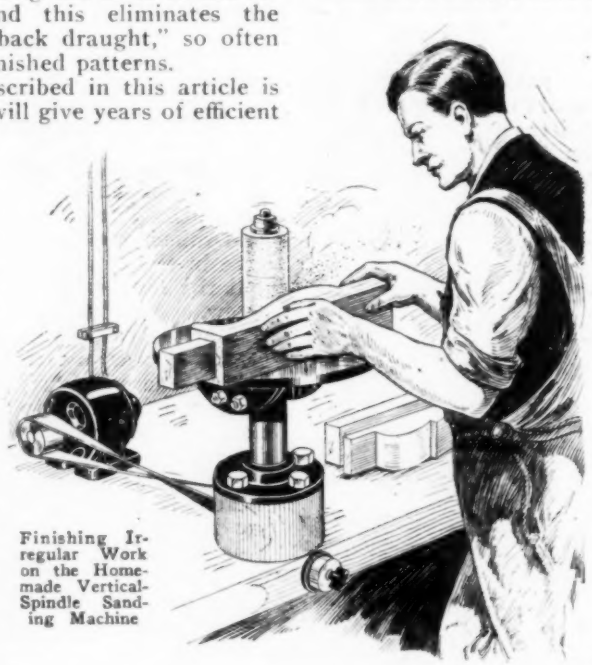
A VERTICAL-SPINDLE BENCH SANDER

By J·V·Romig

A VERY handy and profitable type of bench machine for the small woodworking shop is the vertical-spindle sander. This type of sander is particularly useful in the finishing of internal surfaces, and irregular shapes on patterns, either wood or metal, coreboxes, circular work, etc., being worked in far less time than they can be finished by hand.

On pattern work, the necessary draught is obtained by tilting the table to the required angle, and this eliminates the trouble due to "back draught," so often found on hand-finished patterns.

The sander described in this article is easily built, and will give years of efficient service. It is practically fool and accident proof, as the driving belt runs in the hollow sub-base which guards the operator in case of belt breakage.



Finishing Irregular Work on the Home-made Vertical-Spindle Sanding Machine

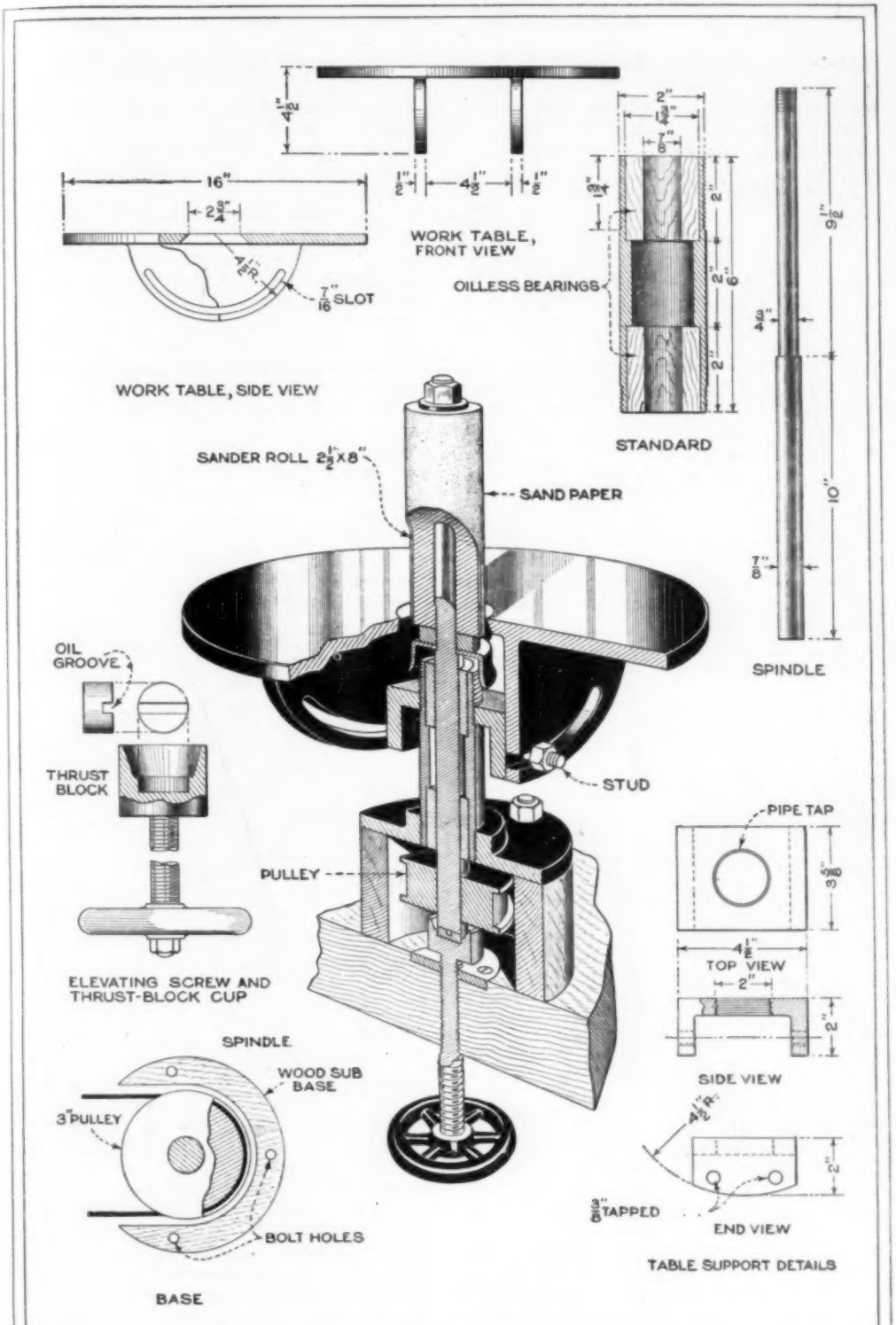
The base of the machine is an extra-heavy 2-in. pipe flange, which is used just as purchased, without any further machining. The standard is a 6-in. length of 2-in. extra-heavy pipe, machined for the bearings and threaded as shown in the detail drawing The lower thread is cut standard length, and screwed into the flange; the upper thread is 1¼ in. long, and is screwed into the tapped hole in the table support. The inside of the pipe is bored 2 in. deep at each end, for the oilless spindle bushings. These bushings are made of wood, impregnated with oil; they take on a high internal polish with wear, and provide enough oil for the spindle so that lubrication after installation is unnecessary. They should be a good press fit in the standard.

The table support may be a casting, machined out of a block of machine steel, or built up, by welding, out of steel plate. The top is drilled and tapped to fit the standard, and the sides drilled and tapped for the ⅜-in. studs that clamp the table.

The table may also be a casting, or built up from plate; the semicircular slots in the sides should have as their center the point shown in the drawing, on the table top, so that the table may swing on the four studs accurately, with the spindle as a center. The top of the table is ground and polished to a perfectly flat surface, the smoother the better. Two lines should be deeply scribed on the surface of the table, one parallel to the axis, the other at right angles to it, to assist in placing and moving the work.

The spindle of the machine is made of a good grade of steel, to the dimensions shown in the drawing. The top is threaded to take the roll-tightening nut, and the bottom is faced perfectly square, and polished. A collar is made to be pressed down over the ¾-in. diameter of the spindle, and to the bottom of this collar is screwed a sheet-metal dust cap, shaped like an inverted dish, which keeps the dust out of the bearing. The collar and cap seat on the shoulder of the spindle.

The spindle is supported by a thrust



A Vertical-Spindle Sander that May Be Built in Any Small Shop, and that Will Prove of Great Value to Woodworkers and Patternmakers

bearing consisting of a bronze disk, slotted as shown, to insure that a constant supply of oil will reach the bottom of the spindle. The disk is carried by a thrust-block cup, which is machined so as to form an oil reservoir. The cup is machined on the top of a ¾-in. elevating screw, working through a plate-steel nut screwed to the top of the bench, directly under the center of the spindle. A large square nut, sunk into the bench, can be used here, if desired. The bottom of the screw is fitted with a hand wheel, which may be taken from an old valve.

The driving pulley is made of steel or cast iron, turned with flanges to prevent the belt from running off; it may be fastened to the spindle either by a key or by two headless setscrews. The face should be made to carry a 1-in. belt.

The sub-base is cut out of hardwood, on the band saw, and mounted on the bench with the belt opening to the rear of the machine.

The sander rolls may be made either of steel or cast iron, and should be perfectly smooth and straight. The bore must also be true with the outer surface. The roll is raised by means of the elevating screw when being covered with abrasive paper or cloth, and lowered for working until the lower edge is below the level of the table top.

The abrasive paper can be purchased in rolls or sheets, and in many grades of fineness. A piece is cut that will fit neatly around the roll, the ends meeting closely, without any lap, and it is cemented to the roll with a special adhesive sold for the purpose. After applying, the roll is tightly wrapped with heavy string and allowed to remain until the cement is dry.

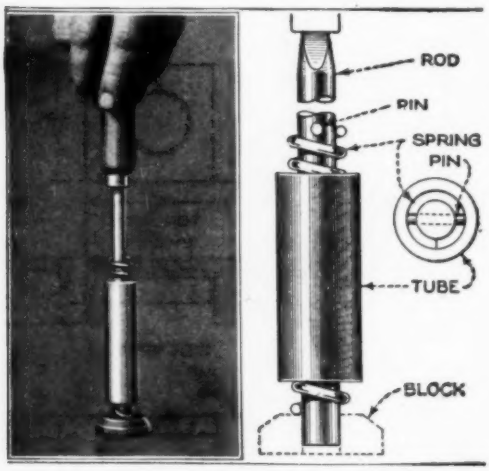
Garnet paper is generally used for wood finishing, and emery paper for metal-pattern work.

The machine is driven, by means of a quarter-turn belt, from a small motor; the speed of the roll should be from 1,600 to 1,800 r.p.m.

A snap switch should be located on the front edge of the bench, for convenience in controlling the motor.

Flattening the Ends of Coil Springs

The illustration shows a handy tool for flattening the ends of coil springs, and one that can be made in a few moments to suit



An Effective Tool for Flattening the Ends of Coil Springs Can Be Made from Scrap Stock

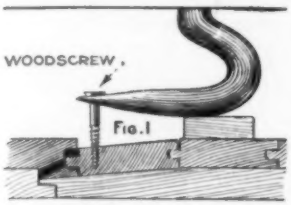
any size spring. It consists of two parts; a length of round-steel rod to fit the inside diameter of the spring, and a piece of pipe or tube to fit the outside diameter. The rod is driven into a wooden handle and drilled for a pin, as shown. The tube, which is only half the length of the rod, is used to cover the spring except the last coil, which is to be held over a gas flame, the tube protecting the rest of the spring from the heat. The spring is held in the flame long enough to anneal the exposed part, and then, while this end is hot, the end of the rod is slipped into a hole drilled in any convenient metal block and the handle pressed down quickly. The coils, will, of course, close for a certain distance before the end is pressed back and the tube will slide back over the pin as the tool advances into the hole. This method of flattening the end is particularly effective in case of brass springs.

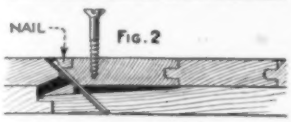
Avoiding Waste of Envelopes

Frequently, in my office, I found that envelopes had become practically useless due to the gummed flaps sticking to the back, which was caused by the dampness of the storeroom. Having a supply of these envelopes on hand one day, I instructed the porter to attempt to pry the flaps open, my own attempts having resulted in tearing them. The porter spread them out on a long table until he had finished the work he was doing. Upon returning, he found that the air circulated by the ceiling fan, which was located directly above the table, had dried the gummed flaps so thoroughly that no trouble was experienced in opening them. —L. H. Unglesby, Baton Rouge, La.

Raising Sunken Floor Boards

The flooring defect shown in Fig. 1 of the drawing is a common one. The primary cause is, of course, careless workmanship, or defects in the sub-floor, which allow the edge of one piece of flooring to drop down from ¼ to ⅜ in. below the level of the remainder of the floor. A simple method of remedying this is shown in the drawing. A screw is driven in near the edge of the sunken piece, and using a wrecking bar with a block of wood as a fulcrum, the edge is pulled back into place, as indicated in Fig. 1. Then holes are drilled and 8-penny finishing nails driven along the edge as far as necessary, as shown in Fig. 2. When the nail and screw holes have been puttied and stained, the repair is unnoticeable.

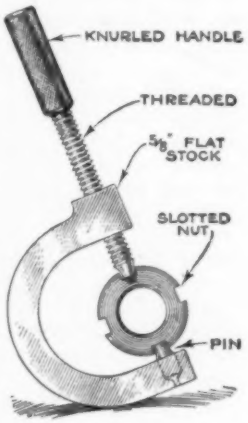




Adjustable Spanner Wrench

Every shop has some machines or tools fitted with slotted nuts, and it usually happens that one of the hardest things to find is a spanner wrench to fit a particular nut.

An adjustable spanner that will accommodate itself to nuts of different sizes can be easily made, and when it is remembered that these nuts are quite generally abused with a hammer and chisel when no wrench is at hand, such a tool is well worth making. The body, it will be seen, is similar in appearance to the frame of a micrometer caliper. One end is drilled and tapped to take a screw, which is turned from a piece of ⅝-in. cold-rolled steel. A pin, driven in the opposite end of the tool, is turned to the form illustrated. The tapered points of the plug and screw are casehardened.



Vat for Scalding Hogs

The most arduous job in the task of butchering hogs on the farm is the handling of the carcass, which usually weighs more than 200 pounds. To facilitate the work of scalding the carcass, and to make carrying of hot water unnecessary, an Oklahoma farmer built the movable scalding vat shown in the drawing. It measures 6 ft. long and about 30 in. wide, and is made of 2 by 14-in. material, the bottom and sides being covered with sheet zinc. In use, it is placed over a small trench dug for the purpose, and a fire is built under the vat to heat the water. Three 8-ft. lengths of chains are attached to two handles as shown, and with their help the hog is lifted in and out of the boiling water, two men being required to do the work. A length of stovepipe is set at one end of the fire trench, to serve as a chimney.—J. M. Collins, Kansas City, Mo.

A Large Vat for Scalding Hogs Is Set over a Trench and a Fire Is Built under It

Packing Piston Head on Pump

The piston head on a pump was packed with square 1-in. packing, which upon being worn out could not be replaced by any local supply house, and this made it necessary to devise an emergency packing. Having plenty of ¾-in. packing on hand, we fitted a ⅛-in. iron band on the head and put the packing over this, which resulted in a good fit. Although this packing was intended for temporary use, it has proved as satisfactory as 1-in. packing.—L. W. Brown, Braemar, Tenn.

Auxiliary Handle for Shovel

When a shovel is used on work requiring little high lifting, as is the case when clearing away snow, usually more of a

An Auxiliary Handle on a Shovel Used for Clearing Away Snow, Is of Considerable Assistance

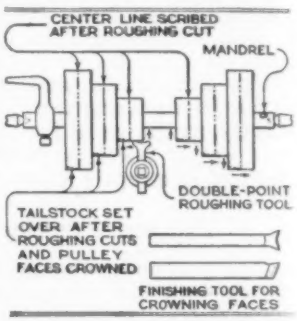
pushing operation than a lifting one, an extra handle attached to the shank of the shovel handle as shown will prove to be of considerable assistance. The auxiliary handle is cut from an old discarded shovel, and is fastened on the shank by means of sheet-metal straps.—Harold E. Benson, Boulder, Colo.

A Homemade Sprayer

The photo shows an efficient sprayer for combating potato bugs. It is made from an old milk can, a length of rubber hose, some lengths of ¼-in. pipe, and fittings that can usually be found in every farm workshop. The cover of the can is soldered tight and a short length of pipe put through a hole in the top and soldered in place, the lower end being about ½ in. from the bottom, so that the entire contents of the can will be used. The upper end of this pipe is fitted with a valve and nipple, and a length of rubber hose is attached to the latter. A tire valve is also soldered in the top of the can, so that the liquid can be put under pressure by means of a tire pump. The sprayer is carried by two men and has been found to be just as satisfactory as any portable sprayer on the market.—Elmer Raihala, Floodwood, Minnesota.

Machining Two Cone Pulleys on One Mandrel

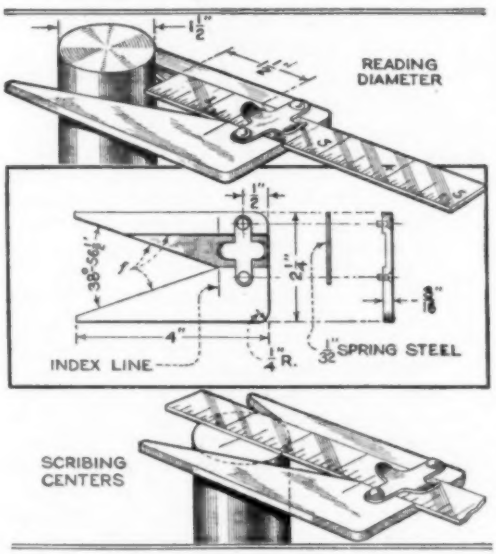
By forging or grinding a double-pointed lathe tool, two cone pulleys, or similar castings may be machined while in place on a single mandrel. A roughing tool is first used, making both longitudinal and end cuts. Its cutting edge is the same as the ordinary lathe tool but a double point is provided, as shown in the drawing, for cutting in opposite directions, the shank of the tool being clamped parallel to the cross slide. The pulleys can be set closely enough together so that both ends can be faced at one cut; the tool is then withdrawn, and the small step of one pulley faced, then fed over without changing the cross feed, and the second casting faced. The second step of this pulley is then faced, and the tool fed along up to the end of the largest step, when, reversing the carriage, it is moved over to the second step of the other pulley. The third step is then end-turned and surface-turned, and the tool is fed over to the third-step surface of the opposite casting. This will rough-turn both pulleys to identical diameters, the face widths being turned to measurement. Next the center line of each step is determined and scribed off, and the tailstock set over enough to turn down the pulley faces to the requisite crown. All steps are beveled until the cuts touch the scribed center lines; the tailstock is then set over in the other direction, or the mandrel reversed, for finishing the opposite tapers, which also meet the scribed lines, thus crowning the steps and completing the job. The finishing tool used for the crowning is similar to the roughing tool except that the noses are ground sharper.


CENTER LINE SCRIBED AFTER ROUGHING CUT
MANDREL
DOUBLE-POINT ROUGHING TOOL
TAILSTOCK SET OVER AFTER ROUGHING CUTS AND PULLEY FACES CROWNED
FINISHING TOOL FOR CROWNING FACES

Shaft-Centering and Calipering Tool

The drawing shows a serviceable and convenient tool for centering shafts and measuring their diameters directly without using calipers. It consists of a steel plate $\frac{3}{16}$ in. thick, 4 in. long, and 2¼ in. wide, having a V-shaped cut at one end as shown, the included angle of the vee being 38°-56′. A groove for the scale to slide in is cut in one side of the plate, with one edge bisecting the apex of the cut. Index marks for reading the scale are made on the surface of the plate at the point of the vee, and at right angles to the slot. A small spring, made of $\frac{3}{32}$-in. spring steel, of the shape shown, is riveted on the plate, to hold the scale when adjusted.

The method of reading the diameters of shafts and cylinders is illustrated in the upper detail. The vee is pressed against the shaft as shown, and the scale is then pushed down until it touches the shaft. The distance from the index line to the point where the scale touches the shaft is equal to the diameter of the shaft and is read directly on the scale. When used for centering shafts, the scale is slid over the vee, as shown in the lower detail, and a line is marked with the scriber across the



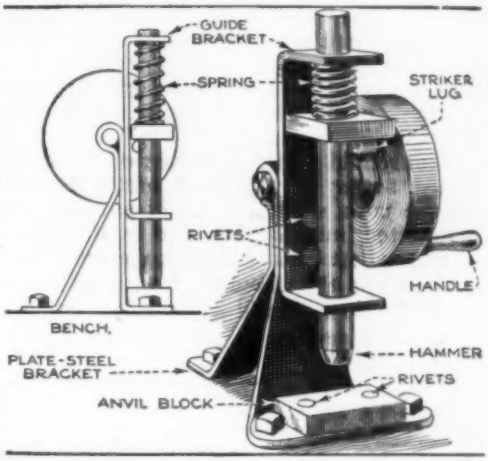
A Serviceable and Convenient Tool for Centering and Measuring Shafts

end of the shaft. Another mark is scribed at right angles to this, the point of intersection being the center of the shaft.

¶For a first coat on wood, wood turpentine should be used as a thinner.

A Hand-Operated Riveter

The work of riveting small parts can be greatly facilitated by providing a small riveter of the kind shown in the drawing, and



A Simple Hand-Operated Machine which Facilitates Riveting Operations Considerably

much more work can be done with it than is usually done by hand.

The riveter is simple to make; it consists of a steel-plate bracket on which is mounted an anvil block, a hammer, a wheel, and a coil spring. The main bracket is screwed to the benchtop and is bent to the shape shown, with an eye bearing at the top to receive the spindle on which the wheel revolves. A guide bracket, also made of steel plate, is riveted to the main bracket at the point indicated; the ends are drilled and bent over so that both holes will be in line to receive the hammer, which is a short round rod of tool steel. A hole is drilled through the hammer and a square collar is pinned on at this point. A strong coil spring is placed between the flange and the upper guide, so that the hammer is held down on the anvil block with considerable pressure. The anvil block is riveted to the base of the bracket, as indicated, and a heavy steel or iron wheel is mounted on the spindle. The wheel is fitted with a striker lug or roller to lift the hammer, and a handle is provided on the other side so that the wheel can be turned by hand. Almost any type of pulley or heavy-rimmed flywheel can be used for this purpose. The ease with which the tool can be operated depends on the weight of the wheel and, therefore, the heavier the latter is, the more smooth and satisfactory will be the operation of the riveter.

A Septic Tank for the Farm

By A. J. R. CURTIS

THE farmer and small-town dweller can easily obtain all the advantages of running water and bath, with perfect protection against contamination of water supply and filth diseases, by means of a septic tank. This method is the most satisfactory for the disposal of household and other wastes, where a regular sewer system is not available, and the ordinary septic-tank installation is not at all difficult to make.

Household wastes are carried from the house sewer or plumbing outlet directly to the tank, where the solid portions are converted into liquids and gases. The bacteria that cause this change are vigorous only in the absence of oxygen, so the tank chamber should be sealed to exclude air. The sewage should remain in the tank at least 24 hours. After leaving the tank, the liquid, in a semi-purified state, flows into a tile line, where an entirely different kind of bacteria, known as aerobies, which require air in order to live, attack the liquids and complete the process of purification.

DIMENSIONS OF SEPTIC TANKS				
NO. OF PERSONS	CAPACITY IN GAL.	WIDTH	LENGTH	LENGTH OF TILE IN FT.
5	250	2'– 0"	4'– 0"	150 TO 250
10	500	3'– 0"	5'–4"	300 " 500
15	750	3'– 6"	6'–10"	450 " 750
20	1000	4'– 0"	8'– 0"	600 " 1000
25	1250	4'– 6"	9'– 0"	750 " 1250
ALL TANKS 5 FEET IN DEPTH				

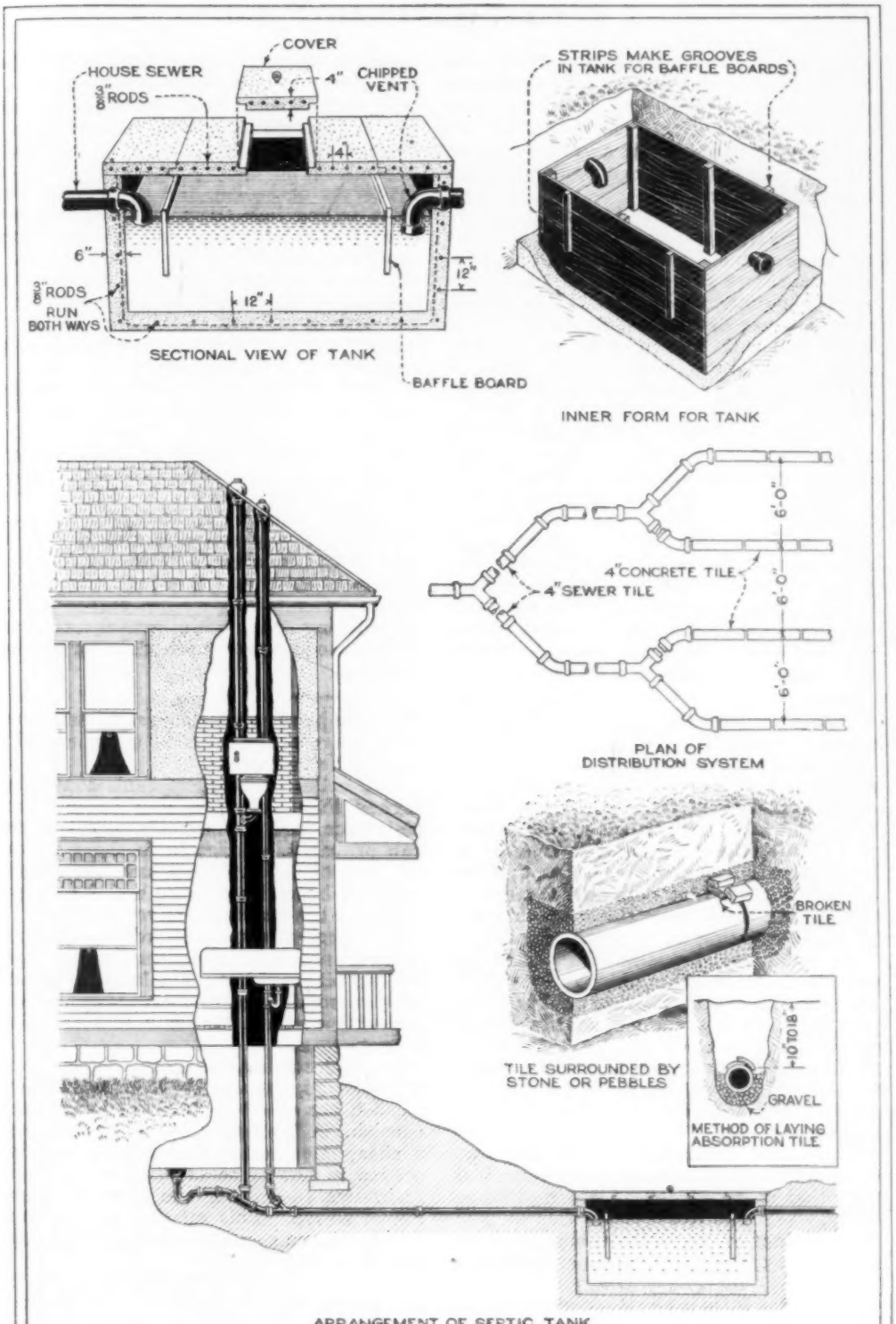
Table Showing Dimensions of Septic Tanks for Various Sizes of Residences

The simplest form of septic tank, and one that gives successful results for small-residence use, is a plain, watertight, concrete tank set below ground. Its size will vary with the amount of sewage to be treated. The tank should be made so that a depth of not less than 4 ft. of liquid may be maintained, and any increase in capacity may be obtained by extending the length rather than the width. In this way the sewage has a longer path to travel before being discharged from the tank and the septic action is more thorough. The wastes should enter the tank at the lowest possible velocity, and for this reason the tank end of the house sewer should have very little pitch. A baffle board must be erected immediately in front of the sewer outlet to reduce the velocity of the flow still further. Likewise, the discharge of the treated sewage should be made with a minimum of disturbance to the contents of the tank. To allow this, the outlet must be provided with an air vent.

The concrete for the tank should be made of a mixture of 1 part of cement, 2 parts of sand, and 3 parts of pebbles or clean broken stone. The walls and floor should be 6 in. thick and reinforced with ¼-in. steel rods spaced 12 in. apart in both directions, or with heavy woven wire. The reinforcement should extend down the walls and across the bottom, forming a sort of basket. The cover should be not less than 4 in. in thickness and reinforced with ¼-in. rods spaced 4 in. apart. It should be made in slabs to make it easily removable for cleaning. In case the tank must be set at a considerable depth, with the weight of several feet of soil upon its top, the cover must be made thicker and stronger than this. A hollow extension to the surface of the ground, large enough to admit of cleaning when necessary, may also be found advisable.

The smallest size tank that is practical is one for a family of five persons, which upon the assumption that the daily sewage production is 50 gal. per person, should have a capacity of 250 gal., if the general practice of sewage retention for at least 24 hours is to be followed. In most cases septic action will begin practically as soon as sewage enters the tank but in rare cases it may be necessary to introduce a quantity of septicized sewage from some other tank. Once started, the action rarely ceases.

The forms for the tank are very simple; the inner form consists of a box, with holes bored in the ends to receive the sewer-pipe "ells" that form the inlet and outlet of the tank. Strips of wood are nailed to the sides at the points indicated, to form grooves in the inner walls for the reception of the baffle boards. Where the soil is self-supporting, an outer form may be dispensed with, and the earth itself used to support the concrete. Where the soil is loose, however, an outer form, consisting of a bottomless box, must be used. The lumber used for the forms should be clean, preferably surfaced, and the joints must be made tight to prevent leakage of the



Details of the Making and Installation of a Simple Concrete Septic Tank: This Allows the Farmer to Install a Modern Plumbing System Where Sewers Are Not Available

concrete. A thorough wetting of the form before placing the cement will swell the wood and assist in making the joints tight. The forms should be greased or oiled before placing the concrete and the mixture must be well spaded in the forms to insure filling all corners.

Since the purifying action is only partly completed in the septic tank, the tile distribution system, in which the aerobic bacteria complete the process, is of almost equal importance to the tank. The liquids should never be allowed to pass directly from the tank into a pond or stream, neither should they be discharged directly into a sump or on the surface of the ground.

The disposal or distribution system should consist of a line or lines of 4-in. drain tile, preferably laid as indicated in the drawing, in order to get a maximum length of tile in a small area. If the septic tank is located near the residence, as is usually the case, the tile leading from this point to the disposal or absorption field should be laid as closely together as possible and sealed with cement mortar in the same manner as a sewer. In the absorption field, however, the tile are laid with open joints near the surface, where the soil carries an abundance of oxygen.

In mild climates 10 in. is sufficient depth for the distributing tile, this being increased to a maximum of 18 in. in colder regions. The open joints are protected by pieces of broken tile to prevent dirt from falling into them and clogging the line. Uniform absorption by the soil along the entire length of the distributing tile will be facilitated by laying the tile to an accurate grade with a fall of about 2 in. per 100 ft. Some authorities prefer a steeper grade at the beginning, changing gradually to a level grade at the end.

The length of the lines of tile will depend upon the amount of sewage discharged and upon the character of the soil. In sandy soils of an open texture which admit of an even absorption, good practice indicates that 3 ft. of tile should be laid for each 5 gal. of daily discharge. In tight, clayey soil this should be increased to 1 ft. or more for each gallon. In certain cases where thorough absorption seems difficult, it is well to surround the distributing tile with gravel, cinders, broken stone, or some other similar porous material.

Moisture-Resisting Coats for Wood

Shrinking and swelling, and internal stresses that cause wood to warp and check, are caused by changes in the moisture content. Such changes are occurring continually when wood is exposed to changing atmospheric conditions, and the only way to prevent or retard them is to protect the wood from the air with some moisture-resisting finish or coating.

In order to determine the protection against moisture afforded by various coatings, a series of tests is being conducted by the U. S. Forest Service, at the Forest Products Laboratory, Madison, Wis. No coating or finish which is entirely moisture proof has yet been discovered, but several have been found that are very effective.

Linseed oil, although it is probably recommended more frequently than most of the other materials for moisture proofing wood, was found in the absorption tests to be quite ineffective. Five coats of hot oil followed by two coats of floor wax failed to give any great protection.

Oil paints form a film over wood which is very durable even in exterior locations. Laboratory tests show, however, that such a film, although it may be continuous, does not prevent moisture changes in wood. Graphite paints and spar varnish are about as effective as the ordinary oil paints with the heavier pigments.

The cellulose lacquers rank somewhat higher than the foregoing in moisture resistance, and considerable improvement can probably be effected in them by the addition of solids. They have the advantages of being fast drying and forming a film over the wood that is very elastic.

Rubbing varnishes afford much more protection against moisture than do spar or long oil varnishes. The larger amounts of gum solids present in rubbing varnish probably account for their greater moisture resistance.

Enamel coatings made by the addition of pigments, such as barytes, to ordinary varnish are about as effective as rubbing varnish. A "bronze" coating, composed of a cheap gloss oil and aluminum powder proved in test to be superior in moisture resistance to any of the coatings mentioned above. This mixture is very fast drying; three coats can be applied in the course of half an hour.

The aluminum-leaf coating developed at the Forest Products Laboratory particularly for the protection of airplane propellers is highly efficient in preventing moisture changes in wood. Such a coating can best be applied to large, unbroken sur-

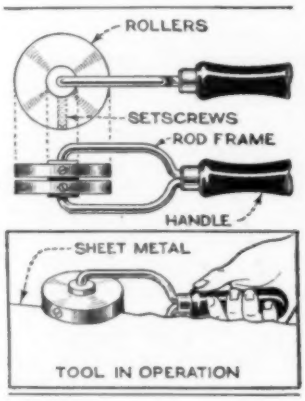
faces. The laying of the leaf on small intricate parts or assemblies is less practical.

Some asphalt and pitch paints are highly moisture resistant. They are rather cheap and may be applied almost any place where their color is not objectionable. Attempts to discover a means of covering asphalt and pitch paints with lighter-colored materials have met with little success.

For temporary protection against moisture changes, vaseline smeared over varnish is one of the most moisture-resisting coatings yet tested. Another good temporary protection is a heavy coat of paraffin. Neither of these coatings, however, can be used on surfaces subjected to wear.

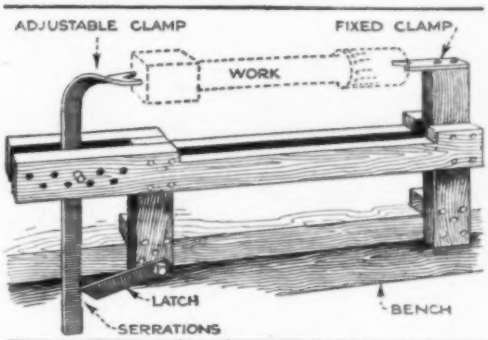
Straightening Sheet Metal

From various causes light sheet metal often becomes bruised or dented along the edges, and before the material can be used, it must be straightened. Wooden or soft-metal hammers are generally used for this purpose, but it is difficult to make the metal perfectly flat with these. For this reason one shop uses the "follow-up" tool shown in the drawing. It consists of two rollers, each fitted with a set-screw to tighten it on a sleeve, which, in turn, is drilled to turn on a frame made from a round steel rod, bent to the shape shown. The shank of the frame is driven into a wooden handle. To operate the tool, it is first set so that the metal fits snugly between the rollers, and after these are tightened on the sleeve, the tool is rolled along the edge of the sheet, with the result that the edge of the metal is made as flat as it was originally.



Handy Fixture for Woodworker's Bench

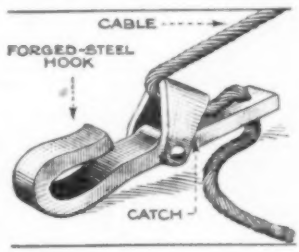
Many irregularly shaped pieces of wood cannot be held in an ordinary clamp vise when shaving, scraping, or sandpapering them, and for this reason the fixture shown in the drawing has been found very useful. It consists of a 2 by 4-in. frame about 5 ft. long, with a fixed clamp at one end and an adjustable clamp at the other. The frame is held by vertical pieces, also of 2 by 4-in. stock, nailed to the edge of the bench. The adjustable clamp is made from a length of flat steel, bent to shape, and drilled to receive a steel pin, which fits in a number of holes drilled through the end of the frame, and staggered as shown. Serrations are filed in the edge of the adjustable clamp near the lower end, as shown, for a latch, which is also made of flat steel. The method of using the fixture is obvious.



A Simple Clamp for the Woodworker's Bench Holds Work for Scraping, Shaving, or Sanding

Adjustable Cable Hook for Hoist Tackle

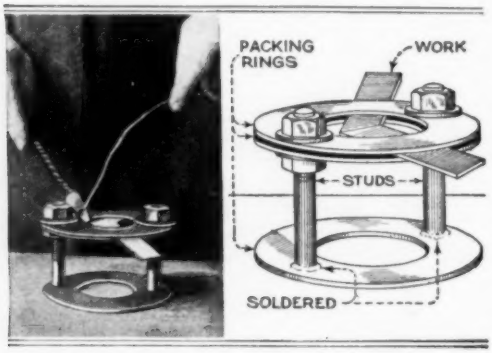
The hooks generally used in connection with slings or hoist tackle are clamped with screws or bolts, and, when they must be adjusted, it is usually necessary to search for tools, causing much loss of time. A hook adapted for general hoisting work, which can be adjusted without delay, is shown in the illustration. The hook proper is a simple flat-steel forging, drilled for a loose rivet and for the cable or sling. A U-shaped catch is made as shown, and riveted over the hook, the edges being first rounded off to prevent cutting the cable.



The cable or rope is passed under the catch and through the hole in the hook as indicated. When necessary, the end of the cable can be hitched around the hook, for additional security. It will be seen that the greater the strain on the cable the tighter the catch will hold.

Soldering Thin Pieces

One source of annoyance when soldering thin pieces end to end is the liability of the work moving during the operation; often a slight touch of the soldering iron



A Useful Clamp Made from Rings and Studs, Used for Holding Thin Pieces While Soldering

is sufficient to disturb their position. A clamp that holds pieces of this character together securely is shown in the photo and drawing; it can be made in a short time from three old packing rings, or something similar, two studs and four nuts, and washers to fit.

One ring forms the base of the tool, and into it are driven the studs, directly opposite each other as shown, a touch of solder holding them permanently in position. The other rings are a loose fit, adjustment being effected by the nuts. The work is held between the top rings, the nuts being tightened by hand. When using this holder, one will also find that the soldering iron will hold its heat much longer than if the pieces are laid on a metal surface as usual.

Glucose for Antifreezing Solution

A substitute for denatured alcohol, in antifreezing solutions for automobile radiators, has been discovered by the chemist of the Bureau of Foods of the Pennsylvania Department of Agriculture. Tests conducted over a period of four years have demonstrated that the substitute is, within certain limits, as efficient as an alcohol or other antifreeze solution, and much more economical.

The substitute is ordinary glucose, a simple sugar made from starch, and extensively used by confectioners and bakers. Glucose is about one-half as sweet as ordinary sugar and costs only 5 or 10 cents per pound. It comes in the form of a colorless liquid.

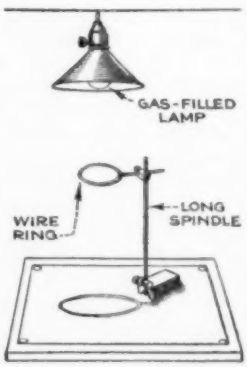
The investigations conducted prove that a solution consisting of 1½ pt. (1 lb.) of glucose, dissolved in 1 gal. of water, will not freeze until the temperature drops to 5° F. The mixture becomes "slushy" at 10°, but does not freeze, and this does not interfere in any way with the circulation.

The glucose will not evaporate, and is in this respect entirely different from alcohol, which evaporates rapidly upon exposure to air. One filling of water and glucose will last for months, provided there are no leaks in the circulating system. Another point in favor of glucose is the fact that it has no harmful effects on the radiator, engine, or on the rubber connections. For the ordinary small car, 3 lb. of glucose are sufficient; larger cars require more.

To farmers and others not having heated garages, the above-mentioned solution is invaluable. When the temperature drops below 5° F., however, the system should be flushed out, drained, and an alcohol solution used.

Drawing an Ellipse by Projection

Every machinist has occasion to do some sketching and drawing at one time or other, but is handicapped considerably by not having the proper instruments, and is therefore "stumped" when confronted with the problem of drawing a figure such as an ellipse. Two tacks and a length of string are sometimes resorted to, but this method is not always satisfactory. A better method is shown in the drawing. A wire ring is fitted to a surface gauge instead of the usual scriber, the long spindle of the gauge being used. The drawing board is then placed directly under a strong electric lamp of the gas-filled type, and the ring placed under it so that a distinct shadow is thrown on the paper. The gauge is placed on the board so that the axis of the wire ring is parallel to the major axis of the ellipse to be drawn. By moving the ring up or down on the spindle of the gauge, the size of the shadow can be varied. When the correct size is obtained for the major



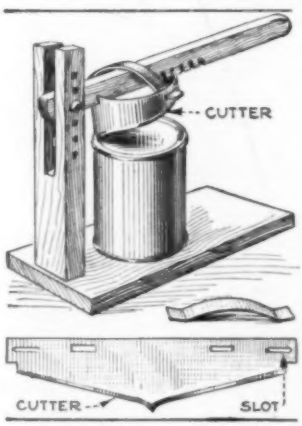
dimension, the ring is turned until the minor dimension measures correctly. The shadow is then traced and a fairly accurate ellipse will be drawn. Of course, no method of this kind can be precise, as it is intended only for sketching and rough layout work.—Edwin J. Bachman, Fullerton, Pa.

Mixing Paint

An eggbeater, such as every housekeeper uses in the kitchen, is far superior to a wooden stick or paddle for mixing paints. When different colored paints are used, it will be found convenient to use a separate beater for each color. They cost only a few cents apiece and can easily be cleaned by working them in kerosene after using.—Walter Chas. Michel, Jersey City, New Jersey.

Quick-Action Can Opener

The can opener illustrated has been found to be of considerable assistance in hotel kitchens and restaurants where a great number of cans are opened every day. The opener consists of a 1-in. board about 6 in. wide and 10 in. long and a 2 by 2-in. upright, which is slotted to receive the end of a handle. A number of holes are drilled through the upright, as shown, so that the handle can be quickly adjusted to any desired height by means of a pin, which also serves as the fulcrum for the handle. The cutter is made from a strip of sheet steel, cut to the shape shown in the lower detail, and sharpened on one edge. It is bent to a circular form, the ends being held together with a bolt and wingnut. The ends should be slotted so that the diameter can be varied to suit cans of different sizes. The cutter is held in place by a strip of spring steel passed over the notched handle and having the ends passed through slots made in the sides of the cutter.—G. A. Luers, Washington, D. C.



Preventing Scouring of Bridge Abutments

In repairing a stone bridge having a 16-ft. span, it was necessary to devise a method of preventing scouring at the bridge abutments, as the stream had a swift current and a sandy-loam bottom. A stone floor, made of heavy "riprap" stones, and about 18 in. thick, was built on the bed of the stream, the smaller stones being wedged and tamped between the larger ones, and a wet mixture of concrete poured over the floor, making it a solid mass. A wall 30 in. deep was built on the upstream side at the end of the floor, to prevent the water from undermining it.—R. F. Mundorff, Kansas City, Missouri.

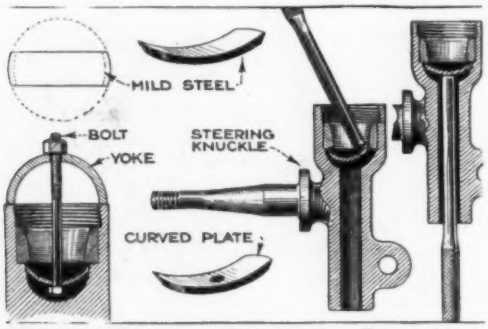
A Concrete-Covered Stone Floor on a Stream Bed to Prevent Scouring of Bridge Abutments

Acid Clears Clogged Pipe

The 1-in. drain pipe carrying away the warm cooling water of a small gasoline engine became clogged with cotton waste at an elbow located under the concrete floor. Clearing the pipe was found to be a problem, as the elbow could not be unscrewed, and a wire stiff enough to push the obstruction away could not be used, as there was another elbow in the way. However, the pipe was cleared in an hour's time by treating the cotton waste with acid. The water above the obstruction was pumped out by means of a small hand pump and a length of rubber tubing, which was only 3/8 in. in diameter and could easily be dropped into the pipe. About 10 oz. of concentrated sulphuric acid was then poured into the latter, and this removed the waste completely.—C. A. Oldroyd, Barrow-in-Furness, England.

Removing Roller or Ball-Bearing Races

If a special puller or driver is not available for removing the ball or roller-bearing cup of an automobile steering



Method of Extracting Roller-Bearing Race without Distorting the Shell

knuckle, the cup must be broken before it can be removed, and this should not be done if possible to avoid it, because the hammer blows necessary to break the cup will distort the shell, and the new bearing will not fit properly.

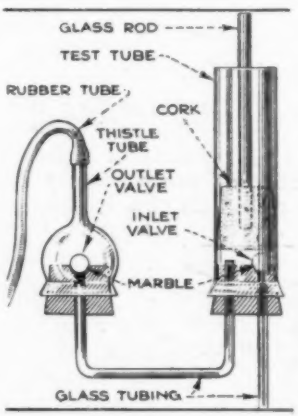
A good method of removing the cup is shown in the illustration. A piece of steel, 3/16 by 1 in., and 1/4 in. longer than the smallest inside diameter of the cup, is bent to form a curved plate, which can easily be forced under the cup. The ends of the plate are rounded to conform to the curvature of the shell. By applying a long punch under the plate the cup can easily be driven out. Where this cannot be done, the cup can be pulled out by drilling a hole in the center of the curved plate, and attaching a long bolt with yoke and nut.

Breaking Off Lathe Cuttings

Accidents are often caused by long, curled lathe cuttings wrapping around the work, or becoming entangled with the chuck or faceplate, and striking the operator as they fly around. This danger can be avoided by cutting or breaking the cuttings off before they become very long. A simple tool for this task is shown in the illustration. It consists of a short strip of flat iron with a hole drilled near one end, and a V-shaped piece cut out as shown. The size of the tool can be varied to suit heavy or light work. To use the tool, the V-end is pushed over the cutting, which enters the hole. Then the tool is twisted and given a quick jerk to break off the cutting. The best results are obtained if the tool is ground on both sides and hardened, and the hole reamed.

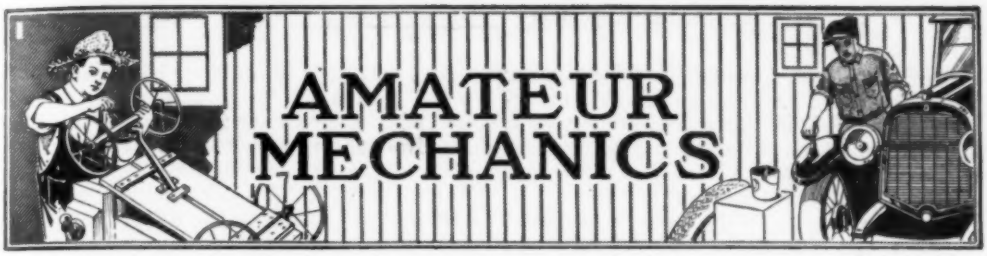
A Simple Acid Pump

Pouring acids and other corrosive liquids from carboys or large bottles is in most cases a highly dangerous operation, and therefore special pumps are often used to transfer the liquids. These pumps are usually quite expensive and for this reason, the homemade pump shown in the illustration was made in one laboratory and found entirely satisfactory. It can be made from odds and ends of broken apparatus found in every laboratory, which makes the cost negligible.



The pump cylinder consists of a test tube with a broken bottom, the rough edges of the break being filed or ground off smoothly. A glass rod, fitted with a rubber stopper, forms the plunger and piston. A rubber stopper with two holes drilled through it, fitted in the lower end of the test tube and lengths of glass tubing are pushed through the holes as shown. A conical depression is cut over one of the holes for a marble to fit in snugly, forming the inlet valve. The outlet valve is made from a thistle tube with the stem broken off; it is fitted with a rubber stopper, having a hole drilled through it for the glass tube from the cylinder, and a seat cut in for a marble. A length of rubber tubing is then attached to the end of the thistle tube.

The joints must be airtight and the piston should be well greased. When the piston is drawn up, a vacuum is created and the inlet valve is opened, which allows the acid to flow in. On the downstroke of the piston the inlet valve is closed and the outlet valve opened, allowing the acid to flow through the thistle tube and into the receiving vessel.

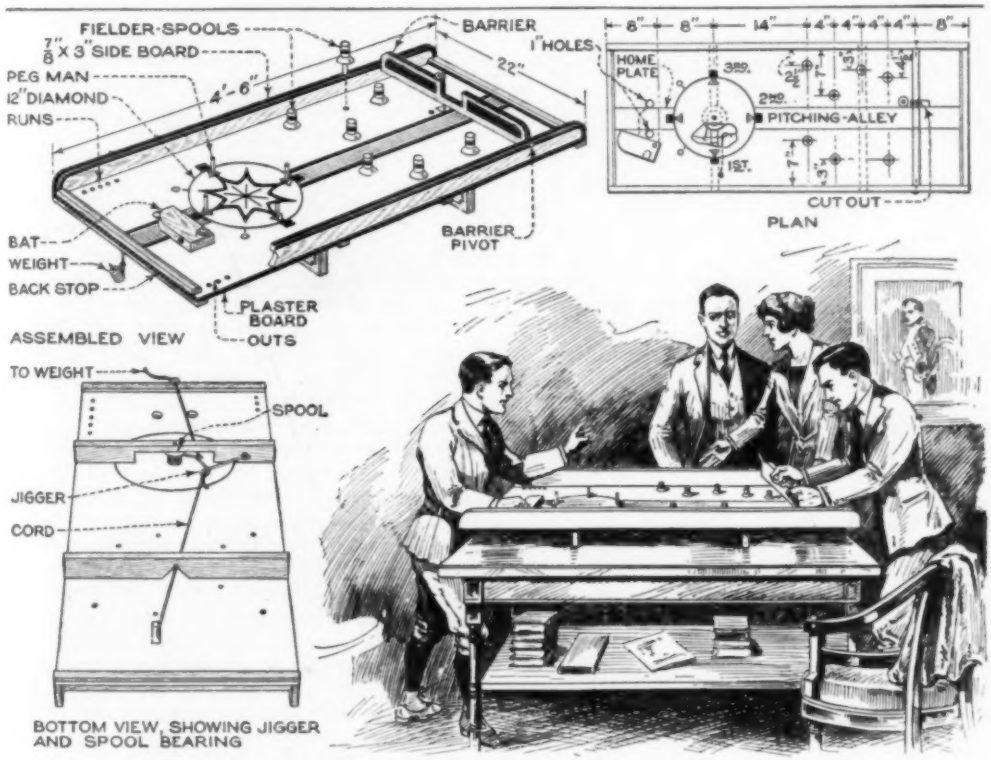


A Homemade Baseball Game

By ROLAND B. CUTLER

PARLOR baseball games are usually quite complicated and "pepless" affairs, but all the skill and chance of a real baseball game are embodied in the homemade baseball board shown in the drawing.

The board is very easy to make and nearly all the material required can be found around the house or workshop, except possibly the piece of wallboard used for the "floor." This piece measures 22 in. by 4 ft. 6 in. in dimensions, and the smoothest side should be up. Two ⅞ by 3-in. side boards are nailed along the top edges, and two supporting cleats, ⅞ by 3½ by 22 in., and two end cleats, ½ by 2 by 22 in., are nailed across the bottom. A back stop, ⅞ by 1 by 20 in., is nailed to the end of the board, on top, and the inner edge is beveled to a thickness equal to half the diameter of the balls, which are ordinary marbles. The barrier piece near the other end measures ½ by 3 by 20 in.; it is loosely pivoted at each end with a wood screw, and its lower edge clears the top of the wallboard by about ⅛ inch.



A Homemade Parlor Baseball Game that Will Provide the Young "Fan" with All the Thrills of the Actual Game: The Details of Construction Are Simple, and the Materials Easily Obtained

A disk, accurately cut out of the wallboard, serves as the diamond. It is 12 in. in diameter and its center is located equidistant from the sides and directly over the supporting cleat nearest the back stop.

A wooden spool, about 2 in. in diameter and about 2 in. long, nailed to the underside of the disk in the center, serves as a bearing on which the diamond rotates. A recess, 2 in. deep and 8 in. long is cut in the cleat to provide clearance for the spool and for the "jigger"—the wire device used to turn the diamond. A wooden pin, driven in a hole drilled in the center of the cleat, serves as a spindle on which the spool and disk revolve.

The jigger is made of No. 10 galvanized wire, or from a pail bail of the same thickness, bent to the shape shown. One end is stapled to the support cleat; a cord is tied to the eye that is formed at the bend, and it is run along the underside of the board, through a V-slot cut in the other support cleat, through a slot cut in the field, and the end is tied to a screweye on the barrier piece. In the upper left-hand figure the barrier piece is shown raised but in its normal position it is dropped, the slot in the board allowing plenty of clearance for the head of the screweye. One end of a 4-ft. length of cord is stapled to the spool under the diamond, and, after it is passed around a hook bent in the short arm of the jigger, runs underneath the board and through a screweye under the back stop; the other end is fitted with a wire hook on which is hung a weight consisting of several iron washers.

The diamond is rotated by winding up the 4-ft. cord on the spool and adjusting the weight so that the diamond will rotate about a quarter turn when the barrier is jerked up quickly. As soon as the barrier is dropped to its normal position the weight will take up the slack in the 4-ft. cord, without causing the diamond to move back again.

The face of the diamond is neatly laid out as shown, a small 1-in. triangle being drawn at four equidistant points around the edge, and a ⅛-in. hole is drilled in the center of each triangle to take a short wooden peg, which represents the man batting or running. About a dozen or more of these "peg men" should be provided. Four jerks of the barrier will rotate the diamond a complete revolution, giving each man a run.

The pitching alley is laid out about 3 in. wide, and the positions of the three bases and home plate neatly marked with black ink; the bases should each be made about 1 in. square and the home plate about 2 in. square. Halfway between the home plate and first base, and also between the home plate and third base, a small O-mark is made, which figures in scoring.

A wooden bat is arranged behind the home plate. It is made of 1-in. stock, 3 in. wide, and 6 in. long, with a screw hole drilled at one corner so that it can be pivoted loosely on a screw. On the opposite side, about 1½ in. from the end, a finger hole is drilled. In use the bat is set in the position shown in the upper right-hand figure and when the ball is pitched the bat is swung around with the index finger to strike the ball, and it will then occupy the position indicated by the dotted lines.

A small ball hole, about 1 in. in diameter, is drilled on each side of the pitching alley, and about 1 in. behind the home plate, in order to make the pitcher "put 'em over;" all balls running into or outside of these holes allow the batter to "take his base."

A number of ⅛-in. holes are drilled in the field at the points indicated in the upper right-hand figure, and the small spools used as fielders are fitted with pins to fit in the holes; the upper rims of the spools are cut off for the sake of appearance. A fielder must be situated directly in front of the slot cut under the barrier to prevent the balls from rolling into it. A row of ⅛-in. holes is drilled on one side of the board in which to set pegs for runs, and three similar holes on the other side for outs. When completed the board can be neatly painted and varnished, if desired, in order to make it presentable.

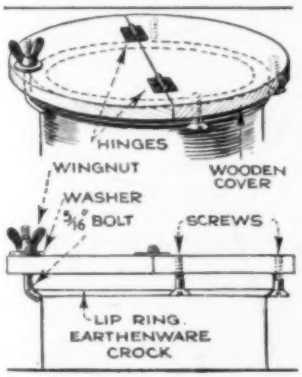
The game, if played correctly, is very interesting and has all the thrills of a real baseball game. The 4-ft. cord is first wound on the spool by turning the disk to the left, and the diamond is brought around so that one triangle is located exactly in front of the home plate. The pitcher then rolls the ball through the slot in the barrier, down the pitching alley, and the batter tries to strike it as it passes over the home plate. If a ball is pitched into or outside of the two ball holes the triangle is advanced to the O-mark, and a peg man is inserted in the hole. But if the batter hits the ball into the field without striking a fielder, it is a fair ball. The barrier is then jerked up and the batter advanced to first base, this move also advancing all the peg men on the diamond. If the ball, upon being hit strikes a fielder, it is supposed to be caught by that fielder, which places the man in an out hole. The same also applies to the batter hitting one of the base runners. On a strike the man on first base is brought back to the O-mark, and consequently this brings every man on the diamond back a short distance. The first two foul balls made by a batter count for strikes as in real baseball. A run is scored by any base runner reaching the

home plate and he is then placed in a run hole. If the pitcher hits a base runner with the ball, the peg men are all advanced a base, or half that distance, or such an offense may be counted as a run for the batting team. If a pitched ball jumps the back stop, the batter is advanced to the O-mark, and a batted ball that jumps the back stop is a foul.

Of course, the rules for the game can be made to suit the players, and they may vary from those given above. However, the more closely the rules comply with actual baseball playing, the more realistic and interesting the game will be.

Cover for Egg Crock

The illustration shows a two-piece wooden cover for a large earthenware crock used for storing eggs. It has been found to be much more convenient than a one-piece cover, besides being air-tight, which the one-piece cover is not. The cover is made of a circular piece of wood, a little larger than the top of the crock, cut in two and hinged as shown. One of the pieces is securely clamped to the crock by means of wood screws driven into the underside, with the heads projecting over the lip ring. A ⅜-in. bolt, with the head cut off and the end bent over to fit the lip ring, is provided on the other half, and is fitted with a washer and wingnut. This makes a clamp that can be tightened or loosened instantly with the fingers.—M. E. Duggan, Kenosha, Wis.

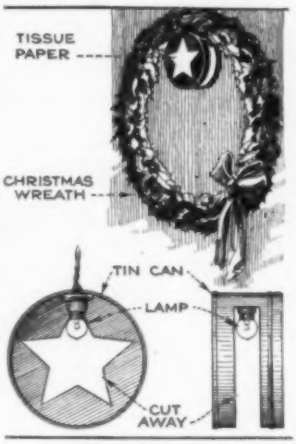


Making Plateholders Fit

Sometimes slides in photographic plateholders become swollen on account of dampness or other causes, with the result that they are hard to push in and out of the plateholder. This trouble can easily be overcome by filing down the swollen parts with a small file. It will be found that it takes but a few moments to make the slide fit perfectly.—Edward H. Flaharty, Denver, Colo.

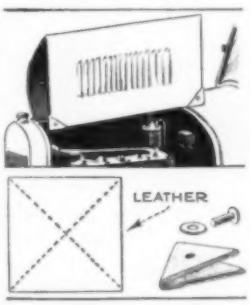
Illuminating the Christmas Wreath

When a wreath is used in the window at Christmas time a very pretty effect can be obtained by illuminating it in the manner shown in the drawing. A small tin can about 4 in. in diameter and 3 in. high is obtained; a can in which hand soap is sold was used by the writer for the purpose. A five-pointed star is laid out on the bottom of the can, and it is cut out with small tin snips or heavy scissors. A slot 1 in. wide is then cut around the side, leaving only about 1 in. uncut. At this point, a small porcelain socket is mounted on the inside as shown; the socket can be purchased in any 5 and 10 cent store. A piece of yellow or red tissue paper is pasted inside of the box over the star, and a small 4-volt lamp is screwed into the socket. A length of flexible lampcord is led through a hole punched in the tin and connected to the socket. The outside of the can is painted with aluminum or gilt paint, and the lamp is mounted inside the wreath at the top.—Thomas W. Benson, Philadelphia, Pa.



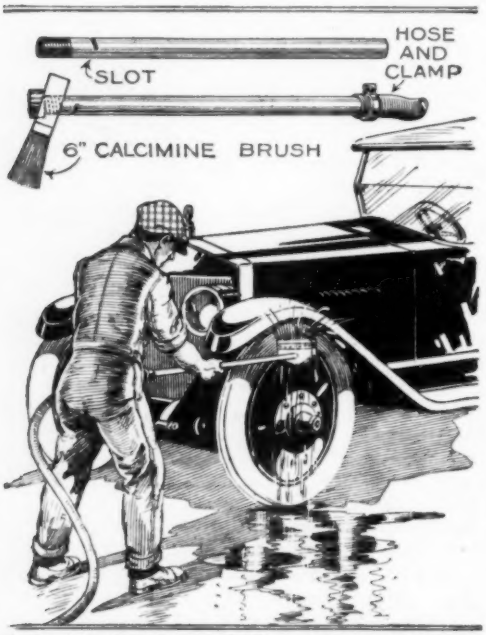
"Fenders" for Auto Hood

The enamel on the auto radiator and cowl is frequently scratched by raising and lowering the hood carelessly. This can be prevented by providing small leather "fenders" on the corners of the hood as shown. They are made from pieces of leather about 2 in. square, folded over as indicated, and riveted to the corners of the hood. Besides preventing scratches when the hood is raised or lowered these fenders also lessen hood rattle, when the hood clips are loose.



Brush for Washing Cars

Washing the running board, wheels, and underside of the fenders of an automobile is usually a tedious and laborious



A Combination Brush and Water Nozzle for Washing the Underside of Auto Fenders and Running Boards

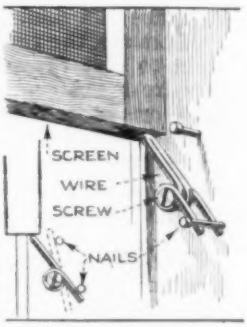
task, as the use of a hose alone is not sufficient to remove the caked mud quickly and thoroughly. The work is greatly facilitated by means of a special washing brush of the kind shown in the drawing. This fixture is attached directly to the water hose and causes a constant stream of water to flow on the surface where the brush is being used.

The brush used for this purpose is an ordinary calcimine or whitewash brush, about 6 in. wide, and having fairly stiff bristles. It is drilled through the wooden part as indicated to fit tightly on the threaded end of a 3-ft. length of ¾-in. pipe. A small slot is cut in the pipe at an angle, so that the water will be directed against the bristles. A cap, of course, is fitted on the end of the pipe, and the water hose is connected to the other end. If the brush tends to work loose on the pipe, the pipe can be threaded further, and provided with a locknut and tapered washer on each side of the brush.

¶ The sleeves of old raincoats can be used to make bags for carrying rubbers.

Catch for Sliding Screen

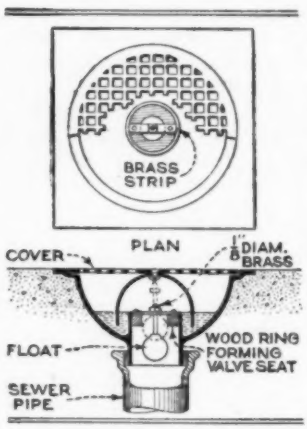
Convenience and simplicity are embodied in an easily made catch for the sliding screen. A piece of wire, about 12 or 14 gauge, is bent to the shape shown in the drawing, to form a catch about 1 in long. The part above the loop is a little longer than that below, and the catch is screwed loosely to the window sash, about ⅛ in. from the screen. Two nails are also driven into the sash to keep the catch in the position indicated. When the screen is raised, the weight of the upper end causes the catch to drop under the lower part of the screen and hold it up. To lower the screen, it is raised slightly, and the top of the catch pulled back. The only necessary manipulation of the catch is when the screen is lowered, as it works automatically when pushed up, the heavier end falling in place itself.—George L. Michel, Jersey City, N. J.



Cellar Drain Converted into Trap

In some localities where the sewer system is too small to carry away the water of an exceptionally hard rain immediately, the water will temporarily back up through the basement floor drain.

In cases of this kind, the ordinary bell-trap floor drain can also be made to act as a back-water trap, as shown in the drawing. A wooden ring is cut from a piece of white pine, to form a valve seat, fitting snugly in the outlet. A brass strip is screwed across the top of the ring to guide the stem of a float; a wooden ball from a small-size croquet set, or a similar ball, makes a good float. The stem is a short



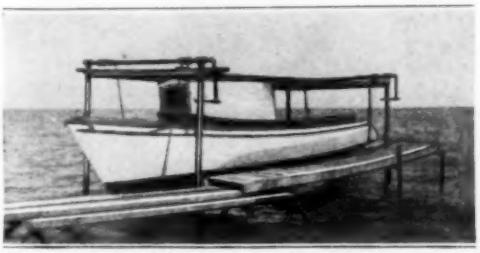
length of ⅛-in. brass rod, screwed into the float and fitted with a nut at the other end to keep the float from dropping through the guide strip. The opening through the valve seat allows the water to flow into the drain, but prevents it from coming out, as the ball rises and closes the opening until the water recedes. —Fred G. Koper, Charleston, W. Va.

Turned Posts for Homemade Furniture

The appearance of homemade tables and other furniture can be improved considerably if round legs are used instead of square ones, which immediately give the job away, no matter how well done. It is not necessary, in most cases, to go to the trouble of having legs made especially for this purpose, or to ransack the market for them, as ordinary stair balusters, which are available in a variety of sizes and forms, can be procured from any dealer in lumber and millwork. These balusters make as neat table, pedestal, and chair legs as can be desired and cost very little.

Mooring Small Motor Boats

An unusual method of mooring a small motor boat was used at a summer resort on the Canadian shore of Lake Erie. A framework of 2-in. pipe and fittings, made large enough for the boat to be floated under it, was constructed as shown in the photograph. A windlass, also made of pipe and fittings, was provided at each end of the frame so that the boat could be

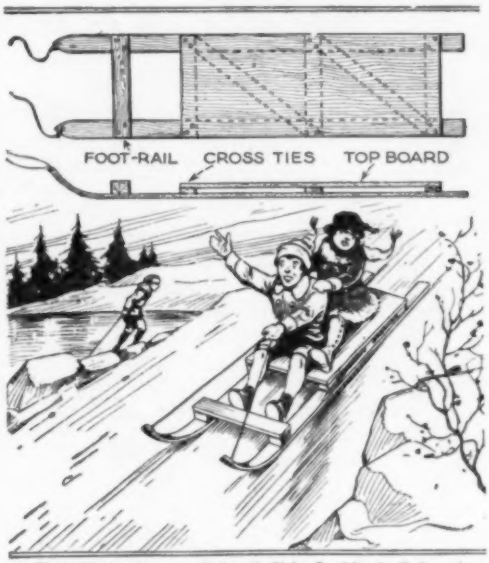


Motor Boat Completely Protected from Storms by Novel Mooring

hoisted clear above the surface of the water whenever necessary, as in stormy weather. Strong chains were provided on each windlass, and these were looped under the boat at the bow and stern as shown. The handle of each windlass can be pushed toward the inside, so that it bears against the frame upright, in order to prevent it from unwinding.—John E. Mason, Hamilton, Can.

A Ski Toboggan

The exhilarating sport of sliding downhill on the snow crust has much to commend it. It also has its dangers, as the crust softens toward spring, and a heavy



A Sled Made from a Pair of Skis Is Much Safer than the Ordinary Kind on Crusted Snow

sled is liable to break through, catapulting its passengers headlong into the frozen snow, which breaks up and presents jagged cutting edges capable of inflicting considerable injury. A sled that is so built as to practically eliminate this danger is shown in the drawing.

It is made from a pair of old skis, securely fastened together by means of three crosspieces and two diagonal braces, as shown in the upper details. The top board and foot rail are attached to this framework by means of wood screws, and a hole is drilled through the end of each ski to take a ¼-in. rope. This sled will slide just as easily and just as far as any other sled, and will not break through the snow crust, or turn over, due to the width of the runners. It is also light in weight and can be easily managed by small children.—C. M. Wilcox, Torrington, Conn.

Putty for Floor Cracks

Cracks in a floor that is stained and varnished may be filled with a putty consisting of 2 parts of glue, 14 parts of water, 4 parts of plaster of paris, and 2 parts of litharge. This putty will take the stain and varnish well.

VACUUM TANKS

BY JAMES TATE

THE principle upon which the gasoline-system vacuum tank operates is very simple, and the tanks themselves are sturdily built and get out of order but seldom—but I have found that the average owner regards the vacuum tank as more mysterious than the theory of relativity, and, when it does get out of order, hasn't the slightest idea what to do.

A very little trouble will enable the car owner to understand the gasoline system thoroughly, and he will then know what to do when trouble develops.

The most widely used type of vacuum tank is that shown in the upper drawings in the full-page illustration. It consists really of two tanks, one fitting within the other, and forming an upper and a lower chamber. The upper chamber has four openings at the top; the gasoline inlet, which is connected to the supply tank, and through which the gasoline is drawn, the vacuum inlet, which is connected to the inlet manifold, an air vent, and an opening into which a pipe plug is screwed. It has one outlet, an L-shaped pipe, with a flap valve at the bottom.

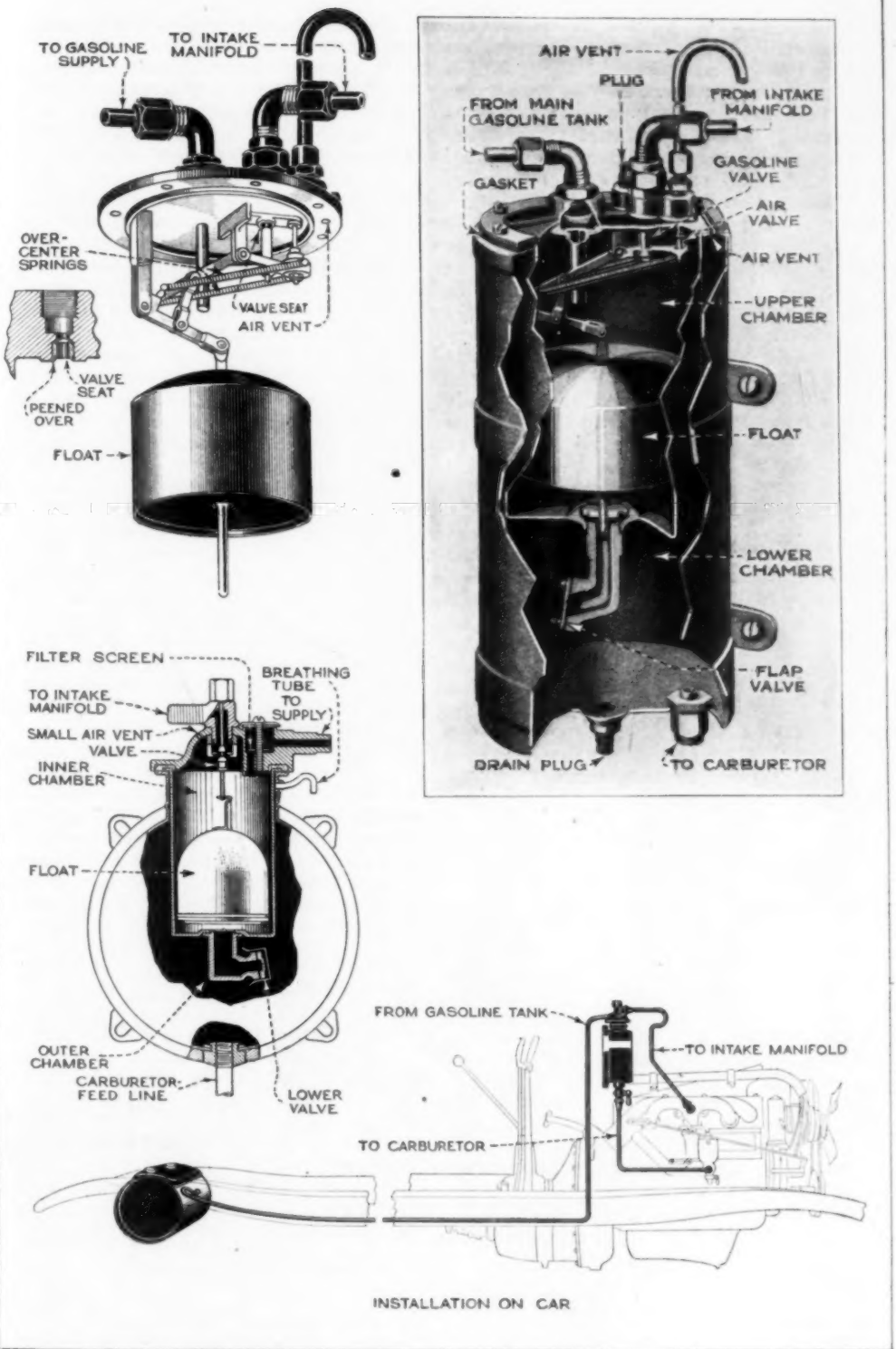
The lower chamber has two outlets; one is a connection to the carburetor, the other receives a plug or cock which can be opened for draining or cleaning the tank, or from which gasoline may be drawn for priming the engine or other purposes. The upper chamber contains a float, which, by means of an arrangement of levers and springs, operates valves in the air-vent and vacuum lines.

The operation of the tank is as follows: The pumping action of the pistons in the engine creates a high suction or vacuum in the intake manifold, and this suction is transferred, through copper tubing, to the upper chamber of the tank. When the float is down, the valve in the vacuum line is open, and that in the air vent closed, consequently gasoline is drawn into the upper chamber from the main tank. The float rises with the incoming fluid, until the springs pass over the pivot of the levers, when they suddenly snap the vacuum valve shut and the air-vent valve open. This allows the gasoline to flow out of the upper chamber into the lower one by gravity. The float now sinks, allowing the vacuum valve to open, and the process is repeated. As the lower chamber is always open to the atmosphere, the gasoline simply flows from it, by gravity, to the carburetor.

Before blaming the vacuum tank when trouble develops, make sure that the fault does not lie elsewhere. When the engine refuses to start, and it is found that there is gasoline in the carburetor, it is obvious that the vacuum tank cannot be at fault, since its work is merely to get the gasoline to the carburetor. If there is no fuel in the carburetor, the fault may be in the method of starting the engine, and not actually in the tank. The tank may only have been partly filled to start with, the carburetor may have leaked, or the engine may have been choked too much in starting. When the latter is done, the raw gasoline is quickly sucked up through the carburetor, and an excessive suction set up in the carburetor and the outer chamber of the vacuum tank. The inner float is probably down and the passage between inner and outer chambers practically closed, so that the engine merely sucks air from the outer chamber. The proper thing to do in such a case is to push in the choke, close the throttle, and crank the engine half a dozen times, either with the starter or by hand; this refills the tank and the engine will start easily.

If the carburetor is dry, and there is plenty of fuel in the vacuum tank, there is probably an obstruction in the line from tank to carburetor, or dirt in the carburetor itself, so both should be examined carefully.

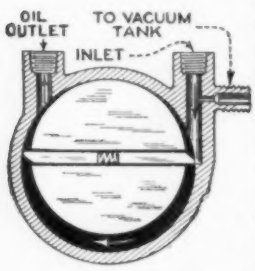
In case the vacuum tank is dry, and the cause is not as before described, make certain that there is gasoline in the main tank. Then remove the strainer under the gasoline inlet to the tank and examine it for dirt. See that the supply line is clear, by blowing through it, and examine every connection and all piping for leaks. If there are any air leaks in the suction pipe



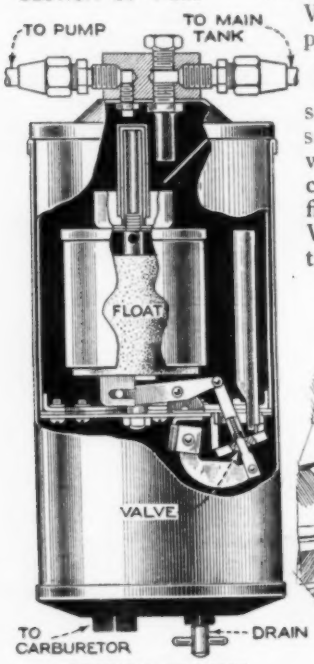
Above, Most Widely Used Type of Vacuum Tank, Showing Operating Mechanism; Below, a Simple, Compact Tank, and Its Mounting and Connections on the Automobile

151

they will, of course, make the system inoperative. Finally, remove the plug in the top cover and pour in about half a pint of gasoline; there may be dirt under the flap valve, holding it open and thus preventing a good vacuum from being built up, and the gasoline will wash this out. This flap valve sometimes acquires a black carbon coating, which prevents it from seating properly. To remove the coating, the upper chamber must be removed; to do this, remove the screws on top, and carefully run a knife blade between the cover and body of the tank around the top, so as to separate the gasket from the tank without damaging it. When the upper tank has been removed, the valve and seat may be scraped clean with a knife, or cleaned with a fine, flat file. When replacing the cover, make sure that the gasket is undamaged, and coat it with shellac, as this joint must be airtight.



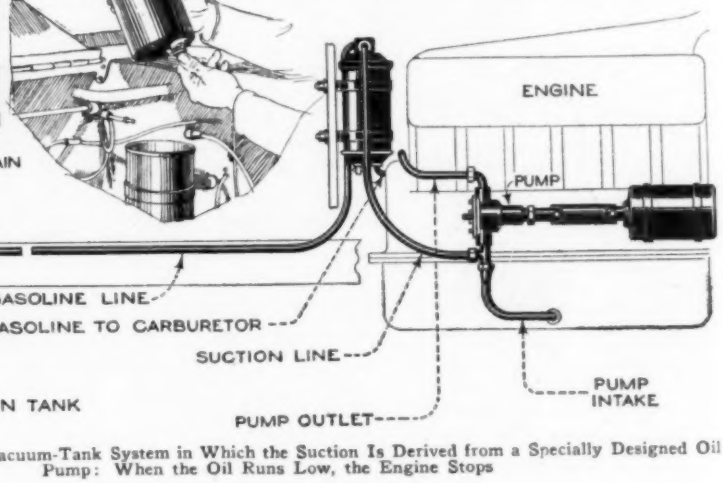
SECTION OF PUMP



SECTION OF TANK AND VALVE MECHANISM

While carburetor trouble cannot possibly be attributed to the vacuum tank, occasionally the vacuum valve may become deranged, allowing raw gasoline to be drawn directly into the manifold. One case of this kind comes to mind, when the engine used up 10 gal. of gasoline in two hours, without being out of the garage. It would "load up," backfire, spit, and stall, in spite of all the adjustments that were tried on carburetor and ignition. The trouble was finally traced to the seat of the vacuum valve, which had become loose and prevented the valve from seating, thus allowing raw gasoline to be drawn directly into the cylinders. The brass seat was removed and $\frac{1}{64}$ in. filed from the bottom end; it was then replaced, and the aluminum peened over it, as shown in the detail drawing. This cured the trouble at once. When trouble of this kind is suspected, the suction-pipe connection at the manifold may be disconnected while the engine is running, and the two parts held $\frac{1}{32}$ to $\frac{1}{16}$ in. apart; if gasoline is running down this pipe, it will drip at the opening.

The air vent allows an atmospheric condition to be maintained in the lower tank, and the long tube on it prevents an overflow of gasoline when descending steep grades. If occasionally a small quantity of gasoline escapes no harm is done, and no adjustment is needed, but, if the vent regularly overflows, it may be found necessary to move the tank, which may be too close to the hot motor. The bottom of the tank should be at least 3 in. above the carburetor, so this should be checked; also, the hole in the main



New Form of Vacuum-Tank System in Which the Suction Is Derived from a Specially Designed Oil Pump: When the Oil Runs Low, the Engine Stops

gasoline tank cap may be stopped up, or may be too small. It should be ⅛ in. in diameter. Persistent overflowing, which cannot be cured by any of the foregoing remedies, may be stopped by attaching a length of tubing to the vent tube, and carrying it to the highest point inside the hood.

If the float should develop a leak and fill with gasoline, it will not rise and shut off the suction, and consequently the tank will flood over. It is not necessary to remove the entire tank to repair a float, but merely to remove the top, as for repairing the flap valve. The float is of copper, nickel-plated to withstand any possible corrosive effects of the gasoline. To repair the float, punch a small pin hole in it, so that the gasoline will run out of the leak, drain the float, then set it in a warm, dry place until the gasoline has all evaporated. Now solder the leak and the pin hole, using the smallest quantity of solder possible, to avoid changing the weight of the float. To test the float, dip it in hot water, when a train of bubbles will immediately mark the leak, if there is one.

To enable one to reach home with a leaky float, remove the plug in the cover when the tank is full. This permits the tank to function as a gravity tank, and the motor will run until the supply is exhausted. The tank is then filled by replacing the plug and running the engine, and the operations repeated.

A simple method of determining if there is dirt under the flap valve is to disconnect the tube leading to the carburetor, start the motor, and hold the finger over the opening in the bottom of the tank. If suction is felt continuously it is evident that the flap valve is being held off its seat; this can be remedied, in many cases, by simply tapping the side of the tank.

Unless gasoline is filtered through a screen or chamois when filling the main gasoline tank, some dirt or sediment will collect in the tank; part of this may be drawn into the vacuum tank, and the strainer under the gasoline-inlet elbow should therefore be cleaned every three weeks. The tank itself should be disassembled and cleaned thoroughly every six months, and some gasoline should be drawn off at the drain plug every two or three weeks. When the tank is taken down for cleaning, examine every part carefully to see that it is in first-class condition.

The vacuum tank shown in the lower part of the full-page illustration works on exactly the same principle as the one previously described, but it will be seen, by referring to the sectional view, that the suction valve is directly connected to the float. The tank is mounted and connected in exactly the same manner as the preceding one, as shown in the illustration, and the remarks applying to the first may also be taken as applicable to the second.

The tank shown in the second illustration, while utilizing the vacuum principle, applies it in a radically different manner. The suction line from the vacuum tank runs, as shown, to the suction side of a specially designed oil pump. When there is plenty of oil in the engine, there is also plenty of suction in the tank, but just as soon as the oil supply runs low, so that it is dangerous to operate the engine, the suction stops, and the vacuum tank refuses to operate. Oil and fuel are both equally important in the operation of the engine, and the designer of this system has insured that an engine that doesn't get oil won't get gasoline either—a splendid safety device.

Another advantage of this system is that the vacuum produced increases with the speed of the motor, thereby keeping the vacuum tank full under the increased demand for fuel. In addition, it is claimed for this system that the oil is kept cooler, due to the admixture of air.

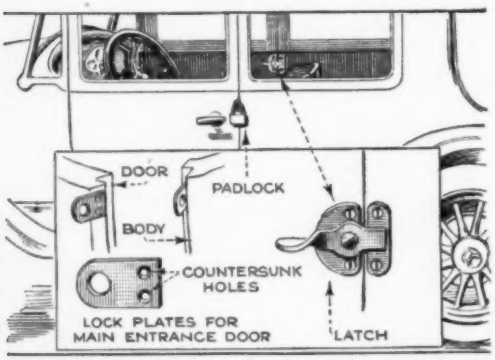
In this tank, the float is of cork, of sufficient size to afford a good factor of safety, so that "gas-logging" will not affect its proper functioning, and is, of course, immune from leakage. Only one valve is employed, and, as this is always immersed in gasoline, air leaks are reduced to a minimum. The gasket is also immersed in gasoline, and there is no need to break the joint to remove the inner tank for inspection of the valve, as it merely slips into the outer one. The entire mechanism of the operating chamber is mounted on its bottom plate, which is removed merely by taking out eight screws. To refill the tank, the plug at the top is removed and about a pint of gasoline poured in. The plug is then screwed home tightly, and the motor started.

These few directions, and the illustrations accompanying, should take the mystery out of the operation of the vacuum tank. The owner should let the tank alone as long as gasoline is reaching the carburetor, and, even if it is not, should always examine the connections and tubing first, to make sure the fault is not there, before opening the vacuum tank.

¶A good filler for cracks in stoves and furnaces is made by mixing equal parts of salt and wood ashes into a paste.

Locking the Closed Car

Many small closed cars are not provided with door locks, and the owners do not always want to pay the price demanded for



Simple Method of Locking the Doors of a Small Closed Car Using Only One Lock

handles of the locking type, or regular pillar locks.

A car of this type may very easily be locked by means of a padlock, however, thus making it a safe place to leave clothing and packages, as well as affording additional protection against car theft. As indicated, the left front door is provided with two flat-iron lock plates, one being screwed in a recess cut in the door edge, the other in the casing, so that the screws are covered when the door is closed. The remaining doors are fitted with simple latches, or sliding bolts, which are fastened before leaving the car.

These fittings are inexpensive, and, with a neat padlock of good make, do not detract from the appearance of the car, while adding to its security against theft.

Regulating Fireplace Dampers

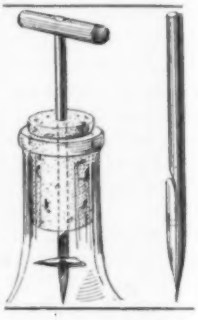
The old-fashioned fireplace is becoming more and more popular with home builders every year; not only for ornamental purposes but for the appearance of cosiness and comfort presented by the open fire. The addition of an open fireplace, however, may cause the main heating plant to waste large quantities of fuel if the damper is not regulated properly, according to weather conditions, when the fireplace is not in use.

In cold and windy weather a strong suction is caused in the fireplace chimney, and consequently much of the warm air escapes, allowing the cold air to leak in through the cracks of the doors and windows. For this reason the fireplace draft should be closed in such weather.

In damp and sluggish weather, however, when it seems impossible to start a circulation of warm air within the house, and very little heat comes from the registers, it is advisable to open the damper of the fireplace. The draft of air moving upward through the chimney will be too slow to draw much cold air into the house from the outside, but will be sufficient to stimulate a stronger circulation through the furnace.

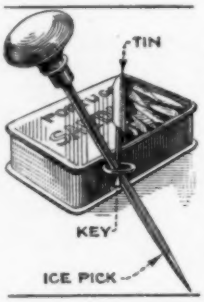
A Cork Extractor

An effective cork extractor, which pulls the corks without breaking them, can easily be made from a large tin-opener key. A small piece of metal, the same thickness as the key, is riveted loosely to the lower end of the key so that it can be turned easily, and both are ground down to a point as shown. In use the small piece is set in line with the key as shown on the right, and the key is pushed down through the cork. By tapping the key lightly the small piece falls to a position at right angles to the key and it is then an easy matter to pull the cork out.—Harold E. Benson, Boulder, Colo.



Opening Sardine Tins

Anyone who has opened a sardine tin knows that while it is very easy to roll back the cover by means of the key until it is in the position shown in the illustration, it requires a very powerful pressure on the key to force the rolled cover past the corner of the tin. If, however, when this point is reached, the point of an ice pick, or similar tool, is inserted through the handle of the key in the manner indicated, a leverage is provided that makes it very easy to strip off the remainder of the cover. This kink will be appreciated by the feminine members of the family, whose fingers are not strong enough to apply the necessary force to the key.

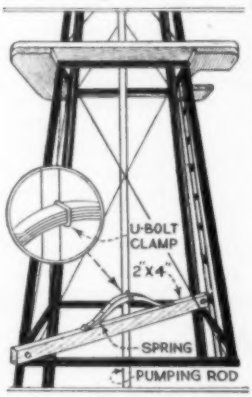


Testing Battery Polarity

A simple method of determining the polarity of a battery or cell, and at the same time roughly measuring its strength, is as follows: Dissolve 1 part of potassium iodide in 25 parts of water; place the solution in a shallow dish, soak several pieces of white blotting paper in it, then remove them and allow to dry. To use, moisten a piece of the prepared paper and touch it with wires leading from both poles of the battery, keeping them about ½ in. apart. A dark-brown spot will immediately be produced where the wire from the positive pole touches the blotter. A dead cell or battery will produce no spot. A little experience in judging the rapidity with which the spot is formed, and the shade of the color produced, will soon enable one to tell the condition of the battery fairly accurately, whether it is nearly dead, half charged, or fully charged. This method is applicable to both storage batteries and dry cells, although the wires must be further apart in the case of storage batteries.—Henry D. Hirsch, Chicago, Illinois.

Buggy-Spring Saves Pump Repair Bills

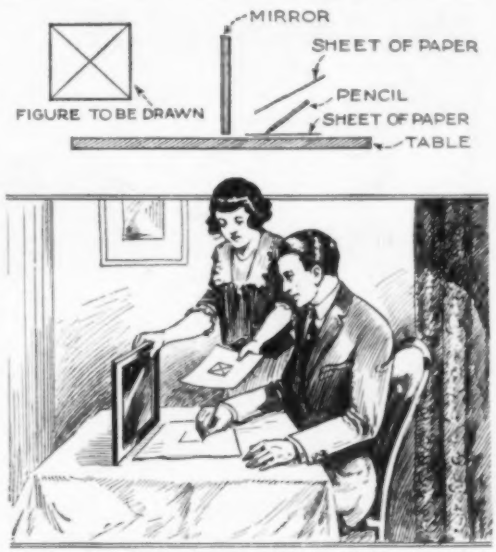
A Wisconsin farmer who had considerable trouble in keeping his windmill and pump in repair concluded that it was the erratic action of the mill that was to blame. The weight of the rods, together with the water being lifted, steadied the mill on the up-stroke but, in a strong wind, the downward motion was always jerky and naturally wearing on the mill and pump parts.



To overcome this, he mounted a half section of a buggy spring on a 2 by 4-in. oak crosspiece as shown in the drawing, and fastened the spring to the plunger rod as indicated. The result was that both strokes were more evenly balanced than before and the jerky action was entirely eliminated, making the mill run smoothly and quietly. The owner claims that this attachment has paid for itself many times over by the elimination of shut-downs and repairs.—G. E. Hendrickson, Argyle, Wis.

An Amusing Trick

An amusing trick that can be performed with a mirror, two pieces of paper, and a pencil is shown in the illustration. One person is seated at a table and is instructed to draw the figure shown in the upper left-hand corner, first drawing the square and then the cross inside of the square. This must be done by looking in a mirror which is held vertically as shown, a piece of paper being used as a shield to prevent the victim from seeing the pencil movements directly.



An Amusing Trick, the Materials for Which Are Available Everywhere

It will be found rather easy to draw the square, but mysteriously difficult to draw the cross inside. In fact, many people find it absolutely impossible to make the pencil start diagonally in the proper direction, and very few can draw a straight line, even when they do make the pencil move in the right direction.—J. R. Minter, Washington, Ind.

Shellac for Floors

A good and durable finish for floors, stairways, and other surfaces that are subject to heavy wear is obtained by applying a coat of shellac over the filler coat, before using the regular varnish. The shellac should not be mixed with the varnish, and if any thinner is required alcohol should be used. The wear-resisting qualities of the shellac will offer a pleasant surprise to anyone who has to varnish floors often, and the gloss obtained has a long life.

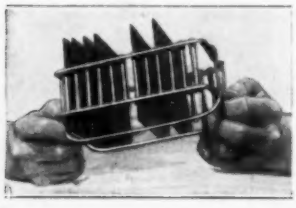
Keeping the Clothespins Handy

The drawing shows a novel method of keeping clothespins handy, much better than carrying them around in a bag or apron. The clothespins used for this purpose are of the spring type, and a number of them are strung on a length of galvanized wire suspended about 4 in. above the clothesline, as shown in the lower insert. The clothespins can be snapped on the line at any desired point, and when not in use they are pushed to the end of the wire.

An Idea that Not Only Keeps Clothespins Handy, But Prevents Them from Being Lost

Dry-Plate Holder Reduces Handling

When handling developed plates that must still be fixed and washed there is always some danger of scratching or imprinting finger marks on them, and for this reason the plate holder shown in the photo was constructed. The frame is made of soft-iron wire, and the slides of short lengths of ¼-in. copper tubing, cut lengthwise and soldered to the frame as shown. After the plates are developed they are placed in the holder and immersed into the hypo solution, then the holder is immersed in running water to remove all traces of hypo. In this way the individual plates are not handled from the time they leave the developing solution until they are dry, and there is very little danger of damaging them.—John H. Schalek, Pittsburgh, Pa.

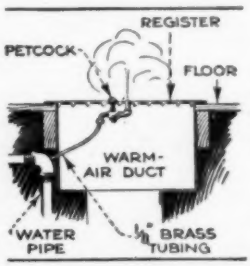


Easy-Starting Fluid for Autos

Many clothes-cleaning preparations on the market are nothing more than pure high-test gasoline, and they form ideal priming fluids for the auto in winter. Purchase a can of cleaning fluid at the drug store—the smell will tell if it is of the gasoline family—and have the druggist put a few drops of ether into the can. The next time the engine is hard to start, prime with this, and the results will be surprising.

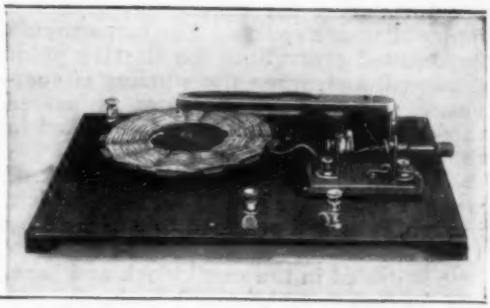
A Furnace-System Humidifier

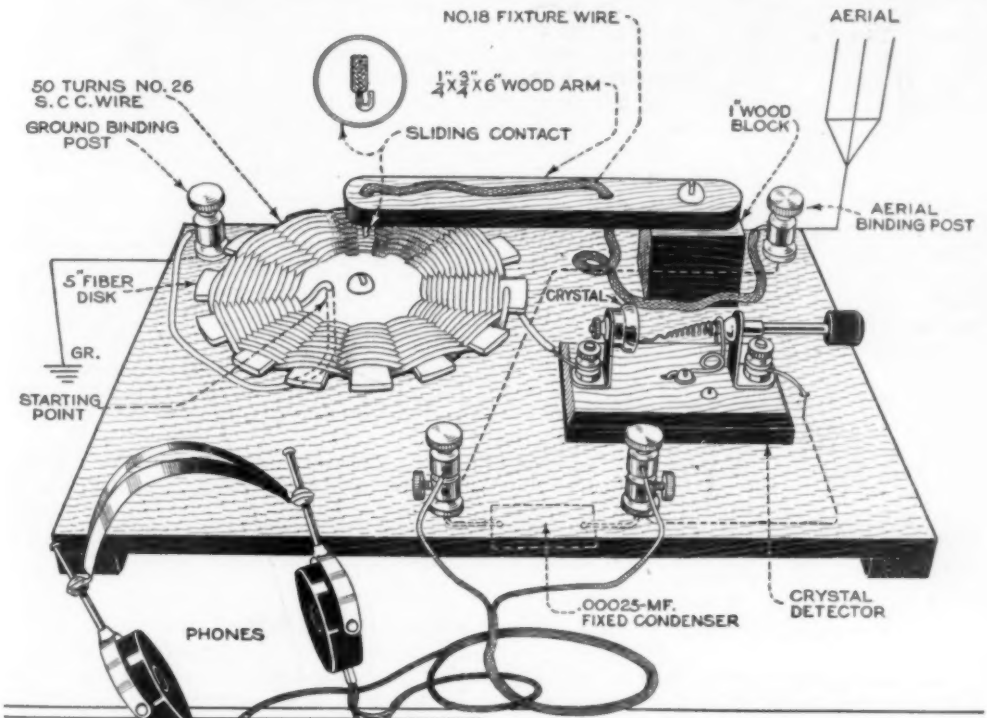
A humidifier for the home using furnace heat can be constructed from a length of ⅛-in. brass tubing and a petcock. It is arranged as shown in the drawing, the brass tubing being connected to the hot-water system, so as to conduct warm water to a register, where it is emitted in a fine spray into the hot-air current. The warmest register in the house should be selected for this purpose. A hole is drilled in the nearest hot-water pipe, and tapped for ⅛-in. brass tubing. A piece of the tubing, long enough to extend to the register, is screwed into the hole, bent as indicated in the drawing, and a petcock screwed on the upper end. The petcock is fitted with a nozzle, made from a short length of brass tubing closed at one end, and having a pin hole punched through it so that a fine spray will be emitted when the petcock is opened. The spray is adjusted by the petcock and should not be allowed to flow so fast that it cannot all be vaporized at once; for this reason the pin hole must be very small. When the spray is once adjusted it will operate without much care or attention. No harm will result if the water is allowed to flow too freely by mistake, as it will then drain down the warm-air duct into the furnace where it will instantly be vaporized.—Paul L. Fetherston, Jackson, Mich.

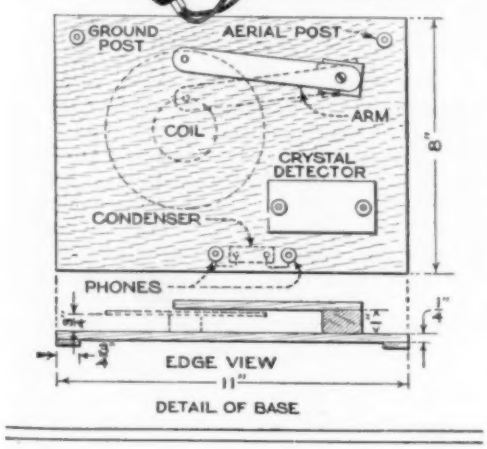


MAKING AN INEXPENSIVE CRYSTAL RECEIVER

THERE is a wide field for a simple and inexpensive crystal detector, both among beginners and "old-timers." The beginner does not usually want to invest much money in a set, until he thoroughly understands the principles involved, and a crystal receiver is ideal for him; the more advanced radio enthusiast, also, can use a crystal set to advantage as a standby for the not infrequent occasions when his large set "goes on strike"—usually when







A Very Simple and Efficient Crystal Receiver, Suitable Either for Beginner or "Old-Timer"

a particularly interesting concert or lecture is "on the air."

The crystal receiver described in this article is easy to build, is always ready to use, will give excellent results up to a distance of 20 miles, and costs only about 65 cents to build.

The coil, which is of the spider-web type, is wound on a form consisting of a slotted fiber disk, $\frac{1}{16}$ in. thick, and 5 in. in diameter. There are 13 "spokes" in the form, and, if fiber is unobtainable, heavy cardboard may be used instead. Fifty turns of No. 26 single cotton-covered wire are wound on the form, the wire being led through a small hole drilled near the center of the disk and then wound on

the form from the center out, over and under alternate spokes. The turns should be counted every time the starting point is passed, and, when the winding is completed, the end of the wire is passed through another small hole and drilled in the end of one of the spokes.

The coil is screwed to a small block of wood, 1 in. square and ¾ in. high, which, in turn, is tacked or glued to a ¼ by 8 by 11-in. baseboard. A bolt may be used if a hole is drilled in the small block and base, and the bolt passed through both. A strip of wood, ¼ in. thick and ¼ in. wide is then cut to a length of 6 in. and the ends rounded. Two small holes are drilled in this strip to take No. 18 insulated fixture wire, and a hole drilled for a screw or bolt. The strip is mounted on a block of wood 1 in. high, and screwed or bolted to the base so that the arm can move freely. The binding posts, detector, and .00025-mf. condenser are then screwed to the baseboard, the condenser being screwed to the underside, between the phone posts.

A length of No. 18 fixture wire with one end bared and doubled over as indicated in the detail, is threaded through the holes in the contact arm, and the other end connected to the aerial binding post. The arm is then moved so as to mark the path of the doubled end of the wire over the coil, and the insulation is carefully scraped off each turn along this path. This is best done with a small piece of emery cloth, doubled and used on edge. Care must be taken that no two turns touch at the bared spots, and the doubled end of the bared contact wire must be cleaned, and adjusted to make good contact with the coil turns.

The starting end of the coil is now connected to the ground binding post, and the other end to the crystal side of the detector. The "cat-whisker" of the detector is connected to one of the phone posts, the other phone post connected to the aerial post, and the condenser connected across the phone posts, all this wiring being done under the baseboard, as indicated in the drawing.

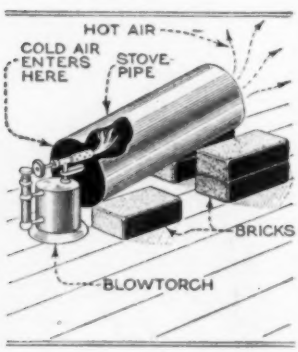
A strip of wood, ¼ by ¾ by 8 in., glued to each side of the base, completes the instrument.

Connect a good pair of phones to the phone posts, solder or clamp a lead from the ground post to a water pipe, and connect up the aerial lead, and the instrument is ready for use. The installation of a suitable aerial and ground for a detector of this type was illustrated and described in the May, 1923, issue of this magazine. If an overhead aerial cannot be used, for any reason, the reader can still get good results by laying three complete turns of ordinary bell wire around the picture molding of the room, leaving one end "open," and connecting the other end to the aerial lead.

This instrument will tune to all wave lengths used by broadcasting stations, and for longer wave lengths it is only necessary to use smaller wire and more turns on the coil.—F. L. Brittin, Chicago, Ill.

Emergency Garage Heater

An emergency garage heater, which is simple but very effective, can be made from a blowtorch, a 1½-ft. length of 8-in. stovepipe, and a few bricks, arranged as shown in the drawing. The stovepipe is set on the bricks at an angle to the floor, and the blowtorch is set at the lower end. It is adjusted to give a bluish flame, which gives the most intense heat, and a circulation of air is immediately set up through the pipe, the cold air entering the lower end, and, after being heated, issuing from the upper end. An improvised heater of this kind will heat a small garage or shed in a very short time.—Perry Chandler, Hillside, Mass.



Trimming Clarinet Reeds

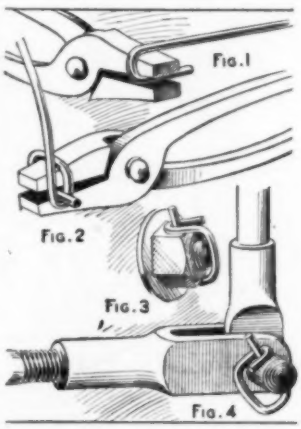
The reeds used for clarinets and saxophones must always be trimmed to take off the rough edges, or to make them stiffer. It is almost impossible to do this perfectly with a knife or shears, but two coins, preferably 5-cent pieces, may be used with good results. Place the reed between them so that the edge to be trimmed projects as much as necessary, having the coins perfectly even, above and below. Hold them with the thumb and finger, and burn off the projecting end of the reed with a match. Run the finger over the burnt edge to take off the charcoal, and this will leave the edge perfectly smooth and round.

Homemade Coal Cabinet

The coal cabinet shown in the illustration is much neater and more convenient than the ordinary kitchen coal scuttle, with its attendant dirt and dust. It is made of strong matched lumber, and, when stained and varnished, makes a presentable addition to the kitchen furniture. A door is fitted at the bottom of the front side, and, directly above the door opening, on the inside an "apron" is nailed, which deflects the coal away from the door; this, with the sloping threshold, prevents pieces of coal from dropping out onto the floor when the door is opened. A ring on the front of the cabinet slips over the door knob and holds the door open when shoveling out coal. The weight of the door holds it shut without any catch.—Jos. C. Coyle, Colorado Springs, Colorado.

Emergency Cotter Pin

A short length of brass or steel wire, bent with a pair of pliers as shown in the drawing, makes an excellent cotter pin, which is self-locking and can easily be attached or removed with the fingers. The wire is first bent over with a pair of flat-nosed pliers as shown in Fig. 1, the end being allowed to project a little. The wire is then given a second twist around the end, as indicated in Fig. 2, and cut off. Fig. 3 shows a pin of this kind used on a bolt, and Fig. 4 how it is used on a clevis pin. An emergency cotter pin, made in this way, serves the purpose just as well as the split cotter commonly used.



Detachable Runners for Baby Carriage

The drawing shows a set of easily made runners for the baby carriage that can be attached or detached in a few moments,

Runners for the Baby Carriage Are Easily Made and Can Be Attached in a Few Moments

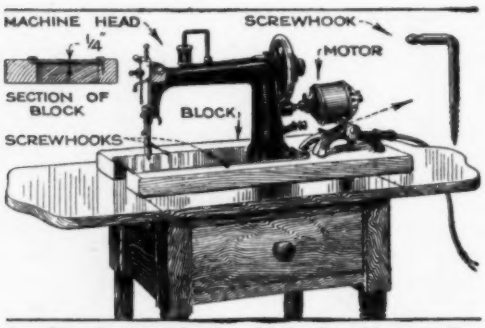
without removing the wheels. The runners are made of light channel iron in which the tires fit fairly snugly, and they are held in place by means of 3/16-in. iron hooks, bent and attached as shown. The front ends of the runners are bent to conform to the curvature of the wheels, and the rear ends should extend about 8 in. beyond the rear wheels. One end of each hook is permanently attached to the runner, and the other end is snapped over the rear axle. The hook should be made a trifle short, as there is a little "give" in the rubber tires, and in this way a tight fit can be obtained.

Vacuum Bottle Aids in Starting Engine

A vacuum bottle, filled with hot water, has been found to be of considerable assistance in starting an automobile engine during cold weather. The intake manifold is wrapped with a woolen rag and the hot water contained in the vacuum bottle is poured over the rag. The object in using a woolen rag is to retain the heat around the manifold as long as possible, wool being an excellent nonconductor of heat. It will be found that sufficient heat is imparted to the mixture inside of the manifold to cause it to vaporize readily.

Remodeling an Old Sewing Machine

An old sewing machine, which was in perfect mechanical condition, but was mounted on an old dilapidated wooden



An Old Sewing Machine Made Portable and Run with an Electric Motor

frame, was made portable by fitting it on another base, and running it by means of an electric motor.

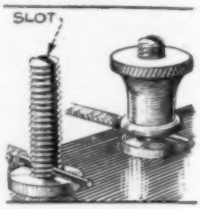
A block of wood 2 by 10 by 21 in. in dimensions, was planed and sandpapered smooth. The head was removed and the space in which it fitted was traced on a piece of paper, making a pattern 6½ by 14 in., with the corners slightly rounded. The pattern was then traced on the new base, leaving a space of 7 in. on the right side, 2½ in. on the back, and 1½ in. on the front. Inside of this mark another rectangle was drawn, ½ in. smaller than the first on all sides except the left side, where it was 2 in. smaller. The block was then cut out on the inside marks, and an opening cut in the left side, as shown in the drawing, so that the bobbin could be manipulated easily. On the outside lines the wood was cut down to a depth of ¼ in., to form a shoulder for the iron base of the machine head. Brass screwhooks of the type indicated, and about 2½ in. long, are screwed into the base on each side of the machine head to hold it in place securely. The base is stained and varnished to give it a neat appearance.

A small motor suitable for running sewing machines can be purchased at any electrical supply store. The motor is clamped in place with one long screwhook of the same type as those used to clamp the head. —A. Seefhoff, Bellerose, N. Y.

When cranking an automobile engine with an electric starter, throw the clutch out; this allows the starter to turn the engine alone without turning the clutch and the idler-shaft gears, and consequently prolongs the life of the battery.

Improving Binding Posts

An ordinary screw binding post can be improved considerably by slotting it with a hacksaw as indicated in the drawing. The wire then can be inserted in this slot and the nut screwed down, making it unnecessary to bend the wire. With such a slot cut in the binding post, the phone terminals of a radio set and similar tips can be held securely without the danger of slipping from under the nut, or the necessity of obtaining regular phone posts.



Paste That Will Not Sour

A paste that will not sour is composed of 3 quarts flour, 3 teaspoonfuls powdered alum and ½ teaspoonful powdered blue vitriol. Mix in dry state and make in the usual way. It is safe to make a barrel of this paste at a time if much of it is used.

Poultry Waterer Made from Carburetor

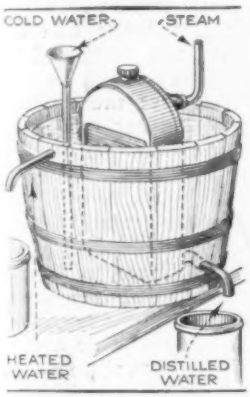
A neat and efficient poultry waterer was made from a discarded carburetor by a Nebraska farmer. The bowl of the carburetor, with the float mechanism, was removed and set into a shallow hole in the ground. The inlet was then connected to a tank set on a post about 2 ft. high, by means of copper tubing. The tank was merely a tin pail, with the tubing soldered into a hole cut in the bottom, and the whole apparatus was located in a shady spot, so that the water would remain cool during hot weather. A sheet of tin, with a hole cut in it for the bowl, was placed on the ground. The float keeps the bowl full.

Saving the Cherries

On many farms having cherry trees, considerable annoyance is experienced in having birds pick the trees bare, even before the cherries are ripe. This can easily be prevented by mounting a stuffed owl on a long slender pole, and setting the pole against the tree so that the owl is among the top branches. The birds will then give the tree a wide berth. If no stuffed owl is available, a mounted black snake will answer the same purpose.—C. A. Martin, Lewisburg, Pa.

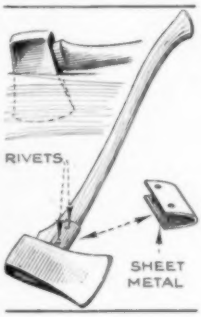
Radiator Used as Still

The drawing shows a simple apparatus for distilling water, consisting of an old automobile radiator placed in a tub of water. The lower outlet of the radiator is connected by a short length of hose to an iron pipe, which is passed through the side of the tub; the upper outlet is connected to the steam pipe. The steam condenses very quickly in the radiator, due to the considerable surface exposed to the cold water in the tub. A constant stream of cold water is admitted into the tub through a pipe that extends nearly to the bottom, and the water, upon rising, passes off through a short overflow pipe.



Guard for Ax Handles

A southern lumberman, who did much timber splitting, had considerable trouble due to his ax handles wearing close to the head, causing them to break easily at this point, and he therefore devised the simple shield shown in the drawing to prevent the trouble. The shield consisted of a rectangular piece of thin sheet iron, bent over and screwed securely to the handle as shown.



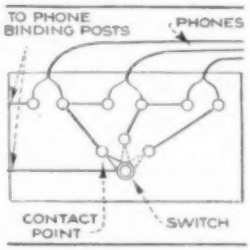
Quick Method of Removing Leaves

The drawing shows an easy method of carrying a large quantity of leaves. A piece of 1-in. wire mesh about 4 ft. wide and 6 ft. long is laid alongside the leaves, which have been raked together as compactly as possible, and the pile is raked onto the wire. Then by picking up the edges as shown, the whole pile can be carried away at once.—Mrs. A. K. Hinkley, Rowley, Mass.

An Easy Method of Carrying Large Quantities of Leaves, by Means of a Piece of Chicken Wire

A Multiple-Phone Connector

The amateur radio "fan" who has two or three sets of head phones will find the arrangement shown in the illustration a quick and convenient means of switching from one set of phones to two or three sets, as he may desire. Six binding posts, and a small 1-in. switch, with 3 switch points, are mounted on a small rectangular piece of bakelite, and the switch points and binding posts are connected as shown. The first binding post and the switch blade are connected to the two phone binding posts on the panel. Moving the switch blade from one point to another puts one, two, or three sets of phones into use. The wiring, of course, is done on the underside of the bakelite.



Hints for the Amateur Mechanic

By J. V. ROMIG

THE amateur mechanic will greatly improve the quality of his work if he takes advantage of the following suggestions, relative to design, selection of materials, and constructional details.

Before starting actual construction, sketch the job in at least three views, giving all dimensions, so that it will be seen just how the finished article is to look, from any point or angle. The design thus roughly sketched can usually be improved by changing a few lines or dimensions, which takes but a few moments. Minutes spent in sketching mean hours saved in construction. In designing any article, the amateur mechanic should always endeavor to hold to simplicity of design, combined with strength.

The best aid to the amateur in learning how to design, in addition to textbooks, is the reading of catalogs and trade journals pertaining to machinery, etc., that can be obtained from many sources. Catalogs should be kept in order; it is best to file them in alphabetical order, or number them, and keep an index book handy so that any book can be found in a moment.

In the selection of materials, the amateur mechanic must have a good knowledge of sizes and shapes usually available. In wood selection, use the tables of comparative strength to be found in handbooks and catalogs. Also select the proper wood for each particular use, as some woods are only good for inside use, while others will withstand the effects of weathering. First-grade lumber costs more, but is worth it. Rather buy dressed lumber from the planing mill than attempt to plane it down from the rough at home, and have the planing mill make extra-thick and wide sections by laminating, as it is equipped with the proper facilities for gluing and pressing.

Steel-shape books are obtainable from all leading steel companies, and, in these, the designer has available the dimensions of I-beams, H-columns, channels, and angles, as well as tables of their strength and other factors. These figures on beams, etc., are particularly useful in the designing and fabrication of small machinery, for which such materials may often be used instead of castings. Structural-steel shapes are easily procured at a few cents a pound, cut and drilled to the buyer's specifications. A knowledge of pipe and pipe fittings is also advisable. Handbooks and catalogs contain tables that show both internal and external sizes, weight per foot, strength, etc., and all such data should be religiously filed and applied.

Mill supplies, such as hangers, shafting, belting, and pulleys, are listed, together with a complete line of tools and equipment, in the mammoth catalogs sent out by large mail-order houses. Their mill and hardware-supply catalogs also give an accurate description and price of each article, and enable one to estimate the cost of completed machines. In many cases, material can be obtained from these houses that cannot easily be obtained locally. Another valuable source of material is the local scrap or junk yard. Here pulleys, flywheels, and gears and wheels from discarded farm machinery and automobiles are found in all sizes. Pulleys that are too small can be rebored, while those that are too large can be bushed down. Shafting can be sawed to suit. Such junk should be bought by the pound, and should not cost more than one-half the amount of similar new materials per pound. Pipe and fittings for high-pressure work, however, should never be bought at the junk yard, but from dealers selling hydraulic and refrigerating machinery and supplies.

When, in the building of any machine or article, special castings are required, the patterns for them should be made as simple as possible. If only one or a few similar pieces are needed, omit, if possible, the cores, as holes can be drilled cheaper than a corebox can be made. Round off all corners of the patterns with fillets of generous size, as castings with sharp corners pour badly, and are apt to crack and break at the sharp juncture of the two angular surfaces. Observe all rules for shrinkage of metal and give sufficient draft to allow the free withdrawal of the pattern from the sand. Fit dowel pins accurately, as a casting never comes out better than its pattern. When building a pattern for a casting, allow for all necessary machining by extra thickness of metal, but try to hold machining down to a minimum. Always have a spare casting or two made up if possible; the added cost is usually not high and saves one the trouble of going into the work again in case the first one is spoiled or broken. Many small bearings can be cast solid in bronze or brass, saving the trouble of bushing a casting made in iron.

Time and expense can often be spared if standard ready-made parts are used, instead of trying to make them.

Prize Offers and Announcements

THEATER TO PAY ONE HUNDRED DOLLARS FOR AN OUTDOOR PLAY

For an original play suitable for presentation on its outdoor stage (56x60 feet), during the summer of 1924, the Forest Theater of Carmel, Calif., offers a prize of $100. Manuscripts should be in the hands of the secretary of the theater before February 1. A nom de plume is not necessary. Play should approximate two hours acting time. There is no limitation as to subject or scope.

NEW USES FOR PRESSED METAL SOUGHT BY COUNCIL THAT PAYS FOR IDEAS

Ideas of new ways to use pressed metal are paid for by the Pressed Metal Trade Extension Council, Chicago, Ill., which issues a free metal booklet describing various things now made with it. Some of these are stewpans, auto bodies, door knobs, railway cars, and shoe eyelets. Pressed metal is anything that can be produced by stamping sheets of steel brass, copper, aluminum, or any other common metal.

HUNDRED DOLLARS OFFERED FOR POEMS PUBLISHED QUARTERLY IN MAGAZINE

One hundred dollars in prizes are given for poems published in each quarterly issue of The Poet and Philosopher, 32 Union Square East, New York City. The conditions of the contest change with each issue of the magazine.

AWARD FOR BLACKBERRY-BRIAR KILLER OFFERED BY NEW ZEALAND MAN

Frank L. Newberry, Shaw St., Reefton, New Zealand, offers an award of 750 pounds sterling for an effective blackberry-bush exterminator that will pass test conducted by New Zealand government experts. It must impregnate itself in roots of bushes without harming surrounding plants.

PRIZES FOR PHOTOS AWARDED MONTHLY BY A MOTION-PICTURE MAGAZINE

Prizes of $25, $15, and $10 are awarded monthly by Shadowland, 65 E. 56th St., New York City, for photographs not previously published. Information stating date and hour of exposure, stop number used, printing medium, and character of print used is required.

PAY FIVE HUNDRED DOLLARS FOR VERSE FOR NEW SMILE SONG

For the best second verse for a future song release "Where Is Your Smile?" a $500 prize is to be paid by Handy Bros. Music Co., 2573 8th Ave., New York City. A free copy of the song and rules of the contest will be sent to prospectiye competitors.

SHORT SALES TALKS ABOUT DRUG-STORE ARTICLES GET MONEY EACH MONTH

Drug clerks and salesmen are offered a first prize of $10, second of $5, and third of $2 for a 100-word statement boosting things sold by the store. Photographs of articles, partly cut to make identification difficult, appear in Drug Topics, 291 Broadway, New York City, monthly.

ESSAYS TO WIN TEN THOUSAND DOLLARS AND UNIVERSITY SCHOLARSHIPS

Ten thousand dollars in cash prizes and scholarships to Yale, Vassar, and other universities and colleges are to be awarded in a prize-essay contest conducted by the American Chemical Society, Munson Building, New York City. It is open to students of high and secondary schools and is intended to stimulate interest in the development of chemical science. Six prizes of $20 in gold are to be given in each state of the Union and the authors of the six best essays from all over the country will win scholarships carrying with them tuition for four years of chemistry or chemical engineering in Yale and Vassar and $500 in cash. Scholarships in other colleges will be awarded. Full terms of the contest are being distributed by the society to high schools and libraries throughout the country.

PAYS TWO HUNDRED EACH MONTH FOR BEST JOKE IN MAGAZINE

For the best joke of less than 100 words, $200 is paid each month by Gloom, Los Angeles, Calif. Three hundred dollars more are awarded monthly, in amounts from $100 to $10, for winning jokes.

TEN DOLLARS PAID FOR FUNNY STORIES THAT ARE ORIGINAL AND SHORT

Ten dollars for the best story, $5 for the next, and regular rates for all others printed are paid weekly by Judge. Original short, funny stories, that have not been published before, are wanted.

BUY SHORT ARTICLE ON THE COMMUNITY FOR FIFTY DOLLARS EVERY MONTH

For the best article of not over 500 words on various phases of community improvement The Delineator, New York City, offers a monthly prize of $50. The subject is changed each month.

FIVE DOLLARS FOR MISTAKES IN MOVIE PAID BY A FILM MAGAZINE

Mistakes seen in the movies, if brought to the attention of Film Fun, 627 West 43rd St., New York, will be published. Five dollars is paid monthly for the winning "film flaw."

TEN DOLLARS FOR HOUSEHOLD IDEAS SAVING TIME AND MONEY

For the best suggestion each month on how to save the housekeeper's time or money The Delineator pays $10.00. All other ideas printed are bought for $5.00 each.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute. The Franklin medal is for workers in technology; the Elliott-Cresson is for original research work and invention; the Howard N. Potts is for important development of previous discoveries and inventions. Each award consists of a gold medal with a diploma. There are also a silver medal, and a Certificate of Merit awarded for meritorious discoveries, and cash premiums for certain work in optics.

Awards to Further Science of Electricity: Medals and prizes, amounting in all to about $20,000; announced February issue, 1923.

For Best Work by American Chemist: An annual award of $25,000; announced February issue, 1923.

Names for Great Lakes Steamers: Two prizes of $50 each; announced February issue, 1923; suggested names must be submitted before the opening of navigation season in 1924.

Essay on Economic Subjects: Prize $1,500; announced March issue, 1923.

Pulitzer Prizes, Columbia University: For best work in various literary and journalistic lines; announced April issue, 1923; nominations of candidates must be made before Feb. 1, 1924.

Scholarships for War Nurses and Ex-Service Men: Numerous scholarships provided at colleges and universities throughout the country under the will of the late La Verne Noyes; announced April issue, 1923.

Most Practicable Device for Recording Mine-Shaft Signals: Prize of £250, or about $1,100; announced May issue, 1923.

Prizes for Essays: Three yearly prizes of $2,500, $300, and $200; announced June issue, 1923; for articles on subjects relating to business development and the modern trust company; closes August 31, each year.

Boys' and Girls' Short-Story Contest: Two first awards of $160, and other prizes; announced May issue, 1923.

Greatest Benefit to Community Rendered by Women's Club: Prize, $1,000; announced May issue, 1923.

Prizes for Essays on Purchasing Power: Three prizes of $1,500, $800, and $500; announced June issue, 1923.

Students' Essays on Municipal Government: Prizes $250 and $100 for postgraduates; $100 for undergraduates; announced May issue, 1923.

Preventive of "Klieg Eyes": Award of $50,000; announced August issue, 1923.

Prize for World Peace Plan: Edward W. Bok, of Philadelphia, offers $100,000 for "the most practicable plan by which the United States may co-operate with other nations to achieve world peace"; announced October issue, 1923.

Prizes for Essay on Plumbing: Two prizes of $100 and $50; announced October issue, 1923.

Awards for Movie Titles: Prize of $10,000 for one word; $20,000 for two words; $25,000 for three words; announced October issue, 1923.

Valuable Hardware Ideas: Trade magazine will pay $10 for best each month and $2 for others accepted; announced October issue, 1923.

Electric Storage-Battery Mine Locomotive: Prize, £1,000; announced August issue, 1923. Working trials of machines selected will be announced later.

Vertical Airplane Flights: Prizes aggregating £50,000; announced August issue, 1923; entries must be received before April 30, 1924.

Science Notes for Daily Use

TELEPHONE RECEIVERS BEST TESTED BY ACTUAL RECEIVING CIRCUITS

The most generally satisfactory method of testing telephone receivers in determining the delicacy and accuracy with which they respond to speech is by comparing one with another in listening to the sounds of the human voice. No strictly scientific method for testing them mechanically, or independent of human observation and estimate, has yet been devised. A musical note is not satisfactory, for two reasons, one is that a sound of such a uniform character tends to pack the carbon granules of the transmitter and its action becomes defective, and the other that the ear, in hearing a note of constant pitch, is quickly fatigued so that a proper estimate of the sound reception cannot be made.

MATCHES CAUSE SKIN DISEASE

When placed in pockets close to the skin, matches have been found by physicians to cause a skin disease that is characterized by unsightly eruptions. The malady starts from the contact of chemical substances in the matches with the skin, usually brought about by perspiration. It is found to be more prevalent among farmers and others who labor in hot weather clad only in light garments.

FLAX LILY OF NEW ZEALAND TO PRODUCE LINEN

As a substitute for flax, the plant from whose fibers linen is made, it has been suggested that the flax lily, which grows in abundance in New Zealand, be used to make the cloth. Through a scarcity of the fabric it has risen in value. The new plant can be grown successfully in many parts of Europe and America and is said to be cultivated with less difficulty than is flax. So far, yields of the crop have produced as much as 2,240 pounds to the acre.

EXPLOSIVES NOW SAFE ITEM FOR RAILROAD TRAFFIC

During one year, railroads of the United States hauled almost 600,000,000 pounds of explosives and a large tonnage of fireworks, according to a report, with but a single personal accident. In addition to these items, a great volume of materials reclaimed from war munitions was carried. The total property loss caused from the only explosion recorded for the 12 months amounted to $75. The damage was done by a bomb which had been in some way placed in a baggage car.

SWATTING FLY NOT ENOUCH AS MOST BLOWS ONLY STUN THE PEST

That 90 per cent of "swatted" flies are not dead but return to life, is the assertion of a scientist. In the course of his researches, he assaulted numerous flies with swatters of mosquito wire, sheet rubber and other materials. In the great majority of cases, he found that the pests were not killed, but were merely suffering from internal injuries and shock and that in most cases the victim recovered sufficiently to climb up a wall to the ceiling, which always is its health resort. As a result of his studies, he urged that the swatting be followed by other means to kill the flies.

WHAT BECOMES OF OLD PINS?

Every year about 10,000,000,000 pins, or approximately 4,000,000 pounds, are made in the United States. The industry has grown to such proportions that it employs over 10,000 persons and annually consumes 26,000 tons of coal, 27,000 cubic feet of gas, and 2,500 barrels of fuel oil. Connecticut, leader in the pin-making business, produces 85.6 per cent of the common variety and 45 per cent of the miscellaneous kinds. The value of one year's output is estimated at $14,000,000. Machines for the manufacture of pins were invented in this country in 1775, but the industry did not start growing until 1836.

TABOO ON HOT FOOD SHOWN IN TEETH FOUND IN INDIAN MOUND

Well-preserved teeth of Indians taken from a mound recently explored in the West indicate that the aborigine was not an eater of hot foods, scientists say. Their theory is that these people used fire in cooking but, since it was done in the open, the food became cold before it was served, thus helping to avoid decay of the teeth.

We recently received a number of technical papers from a gentleman who signed himself merely M. Weiss or Weuss, Germany. We would be glad to receive the full address of this contributor.

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